Investing in people, discovery and innovation

Departmental Performance Report

for the period ending March 31, 2007

Minister of Industry

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List of Abbreviations

CFI	Canada Foundation for Innovation
CGS	Canada Graduate Scholarships
CIHR	Canadian Institutes of Health Research
CRC	Canada Research Chair
CRD	Collaborative Research and Development grant
DPR	Departmental Performance Report
HQP	Highly Qualified Personnel
I2I	Idea to Innovation
IP	Intellectual Property
IPM	Intellectual Property Mobilization
IRDF	Industrial Research and Development Fellowship
MFA	Major Facilities Access
MRS	Major Resources Support
NCE	Networks of Centres of Excellence
NSE	Natural Sciences and Engineering
NSERC	Natural Sciences and Engineering Research Council of Canada
OECD	Organisation for Economic Co-operation and Development
PDF	Postdoctoral Fellowship
PWGSC	Public Works and Government Services Canada
R&D	Research and Development
SSHRC	Social Sciences and Humanities Research Council of Canada
USRA	Undergraduate Student Research Award

Section 1 – Agency Overview

1.1 Minister's Message

I am pleased to present NSERC's *Departmental Performance Report* for 2006–07.

My goal as Minister of Industry, and one of the top priorities of Canada's New Government, is to ensure we maintain a strong economic environment — one that allows Canadians to prosper in the global economy. We are seeing great changes in the international marketplace. New trade agreements, rapidly advancing technologies and the emergence of developing countries are all contributing to today's business environment. Canada needs to keep pace.

Part of my mandate is to help make Canadians more productive and competitive. We want our industries to continue to thrive and all Canadians to continue to enjoy one of the highest standards of living in the world.

For this to happen, the government is committed to maintaining a fair, efficient and competitive marketplace — one that encourages investment, sets the stage for greater productivity, and facilitates innovation. We are relying on market forces to a greater extent, regulating only when it is absolutely necessary. Our policies have helped turn research into new products and business processes. In addition, we are making efforts to increase awareness of sustainability practices among Canadian industry, emphasizing the social, environmental and economic benefits they bring.

The Department and the Industry Portfolio have made progress on a wide range of issues this past year, most notably in the areas of telecommunications, science and practical research, manufacturing, small business, consumer protection, patents and copyrights, tourism and economic development.

The Industry Portfolio is composed of Industry Canada and 10 other agencies, Crown corporations and quasi-judicial bodies. These organizations collectively advance Canada's industrial, scientific and economic development, and help ensure that we remain competitive in the global marketplace.

We have accomplished much this year. Using *Advantage Canada* — the government's long-term economic plan — as our roadmap, we have made great strides toward many of our most important goals. We will continue to focus on these goals to support the conditions for a strong economy — an environment that Canadians expect and deserve.

Jim Prentice
Minister of Industry

1.2 Management Representation Statement

I submit for tabling in Parliament, the 2006–2007 Departmental Performance Report for the Natural Sciences and Engineering Research Council of Canada (NSERC).

This document has been prepared based on the reporting principles contained in the *Guide for the Preparation of Part III of the 2006–2007 Estimates: Reports on Plans and Priorities and Departmental Performance Reports*:

- It adheres to the specific reporting requirements outlined in the Treasury Board Secretariat guidance;
- It is based on the department's approved Strategic Outcome(s) and Program Activity Architecture that were approved by the Treasury Board;
- It presents consistent, comprehensive, balanced and reliable information;
- It provides a basis of accountability for the results achieved with the resources and authorities entrusted to it; and
- It reports finances based on approved numbers from the Estimates and the Public Accounts of Canada.

_____

Suzanne Fortier, President
Natural Sciences and Engineering Research Council of Canada

1.3 Summary Information

Canada's prosperity depends upon people, knowledge and innovation, especially in science and technology, as we transform our economy from one based on commodities to one based on value-added products in all sectors. Science and technology will also continue to enhance our quality of life by helping us improve the management of our resources, environment, public education and health system.

NSERC is the primary federal agency investing in research and research training in the natural sciences and engineering disciplines. It is funded directly by Parliament and reports to it through the Minister of Industry.

Our mission is to invest in people, discovery and innovation to build a strong Canadian economy and to improve the quality of life for all Canadians. NSERC advances government-wide priorities of building a stronger Canada, creating opportunities for young Canadians and investing in knowledge and creativity.

Created in 1978, NSERC's legal mandate, vision and mission are outlined in Figure 1.

The agency's ultimate objective is to advance Canada's prosperity and high quality of life by supporting the creation and transfer of knowledge in the natural sciences and engineering (NSE) in Canada, and by ensuring people are trained to use and create that knowledge. To achieve this, NSERC supports research in Canadian universities and colleges that meets the highest international standards of excellence and supports the education of young people in that research.

As a result, Canada has access to leading-edge science and technology from around the world and highly-qualified experts. Partnerships with industry connect researchers with those who can use the new knowledge productively and enhance Canada's capacity for innovation. Innovation contributes to wealth creation in the economy, which produces prosperity. New knowledge in the NSE also enhances our quality of life through its impact on many policies, regulations, practices and institutions.

Figure 2 highlights the financial resources expended by NSERC priority and expected outcomes. The evidence presented in Section 2 suggests that all of the 2006-07 results successfully met expectations.

Figure 1
NSERC's Mandate, Vision and Mission

Mandate NSERC was created in 1978. "The functions of the Council are to promote and assist research in the natural sciences and engineering, other than the health sciences; and advise the Minister in respect of such matters relating to such research as the Minister may refer to the Council for its consideration." *(Natural Sciences and Engineering Research Council Act, 1976-77, c.24.)*
Vision NSERC will help make Canada a country of discoverers and innovators for the benefit of all Canadians.
Mission NSERC will achieve its vision by investing in people, discovery and innovation through programs that support university research in the natural sciences and engineering on the basis of national competitions.

Figure 2
NSERC's Resources, Priorities and Expected Results

Reason for Existence:

The Natural Sciences and Engineering Research Council of Canada (NSERC) works to make Canada a country of discoverers and innovators. To achieve this, we invest in people, discovery and innovation in Canadian universities and colleges.

Total Financial Resources:

Planned Spending	Total Authorities	Actual Spending
$902.0M	$903.7M	$895.4M

Total Human Resources:

Planned	Actual	Difference
313	308	-5

Departmental Priorities:

Priority	Program Activity – Expected Result	Performance Status	2006-07 Planned Spending	2006-07 Actual Spending
Strategic Outcome: Highly skilled science and engineering professionals in Canada **Government of Canada Outcome:** An innovative and knowledge-based economy				
Develop Tomorrow's Discoverers & Innovators	**Promote Science and Engineering** – Increase student interest and abilities in science, mathematics, and research.	Successfully Met	$4.1M	$4.0M
	Support Students and Fellows - Number of students gaining research and professional experience, the employment and salary levels of award recipients compared to the general population, and the average degree completion rates and time to completion of award.	Successfully Met	$137.8M	$128.0
	Attract and Retain Faculty - Number of researchers attracted to and retained by Canadian universities	Successfully Met	$167.7M	$145.2M
Strategic Outcome: High quality Canadian-based competitive research in the natural sciences and engineering **Government of Canada Outcome:** An innovative and knowledge-based economy				
Build on Canada's Strength in Discovery	**Fund Basic Research** - The creation and dissemination of knowledge to the research community and end users, the practical research experience gained by students and fellows who work with supported researchers, the employment of postgraduate students in well-paying jobs, and the diversified intellectual and infrastructure base maintained at postsecondary institutions across Canada.	Successfully Met	$406.3M	$440.8M
Seize Emerging Research Opportunities	**Fund Research in Strategic Areas** – The amount of research funding leveraged from other partners, metrics on knowledge creation and dissemination, experience gained by students and fellows supported through such research and subsequent employment and salary levels, the development of long-term relationships between partners, and the increased collaboration between researchers in different disciplines and the new knowledge or technologies that result from such interdisciplinary collaborations.	Successfully Met	$54.4M	$53.1M

Priority	Program Activity – Expected Result	Performance Status	2006-07 Planned Spending	2006-07 Actual Spending
Strategic Outcome: Productive use of new knowledge in the natural sciences and engineering **Government of Canada Outcome:** An innovative and knowledge-based economy				
Realize the Benefits of University Research	**Fund University-Industry-Government Partnerships** - Research funds leveraged from partners, knowledge creation and dissemination to research community and users, experience gained by students and fellows and subsequent employment and income levels, long-term relationships established between partners, numbers of patents and licences generated, and economic value of intellectual property generated through funded research.	Successfully Met	$115.2M	$112.3M
	Support Commercialization - The performance of supported institutions in managing their intellectual property (IP) assets for economic and social benefits, and the number of commercialization specialists trained and their subsequent employment and income levels. The number of successful validations of technical and economic feasibility of an invention or discovery, the ability of small and medium-sized companies to acquire new technical capabilities and/or take a new product to market, and the number of HQP trained through such projects.	Successfully Met	$16.5M	$12.0M

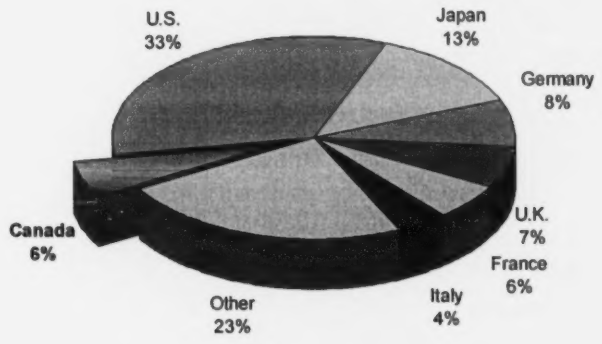
1.4 Departmental Performance

Before NSERC's departmental performance is described, it would be useful to situate NSERC in Canada's and the world's systems of innovation. NSERC's support for research and training is typical of many similar agencies around the world known as "granting councils." Along with the more traditional role of education, universities worldwide have become centres of knowledge creation. In most industrialized countries, universities play a key role in the economic development of the nation. Because of the socio-economic benefits of university education and research, government funding of these institutions and their activities has become the norm.

Environmental Context

University research is now a very large endeavour. In 2005, member countries of the Organization for Economic Co-operation and Development (OECD) spent $171 billion on university research (see Figure 3). Canadian university professors and students performed 6% of this total. When measured as a percentage of GDP, Canada spends more on university research than all of its G7 competitors and places second among OECD countries, only slightly behind Sweden (see Figure 4).

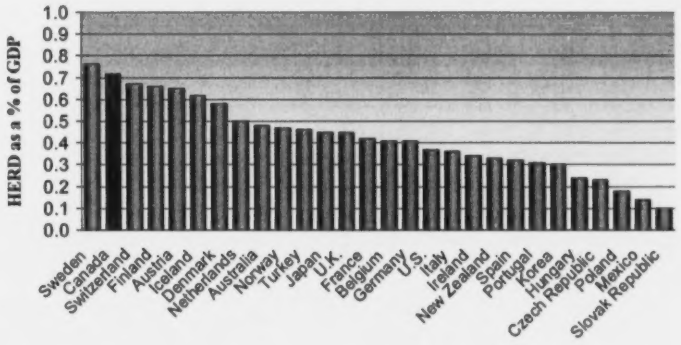
Figure 3
University R&D Expenditures in the OECD, 2005



Total: $171 Billion

Source: OECD

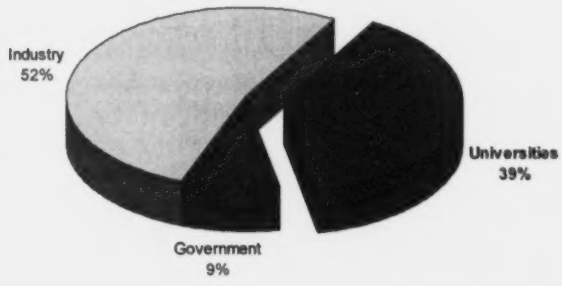
Figure 4
Higher Education R&D (HERD) as a Percentage of GDP, 2005 or Most Recent Year



Source: OECD.

In 2006, university research represented 39% of all Canadian research, as measured by expenditures (see Figure 5). This percentage is much higher than the OECD average of 18% of R&D performed by universities in member countries. Of the $10.9 billion of direct and indirect investment in Canadian university research in 2006, 42% was allocated to the natural sciences and engineering (NSE).

Figure 5
R&D Performance in Canada, 2006

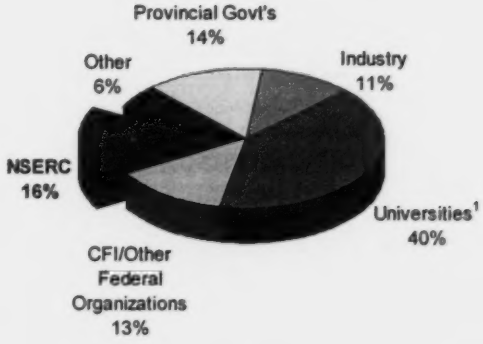


Total: $28.4 Billion

Source: Statistics Canada

NSERC is the most important funder of research in the natural sciences and engineering in Canadian universities. In 2006, $4.6 billion was spent on research in the natural sciences and engineering in Canadian universities. NSERC directly provided almost one-sixth of the total funding. Since many of the other expenditures from university, industry and government sources are contingent upon NSERC funding and peer review assurance of quality, a reasonable estimate makes the agency directly or indirectly responsible for slightly less than half of the total expenditure. Figure 6 gives a breakdown of the total funding by direct source.

Figure 6
University R&D Funding in the Natural Sciences and Engineering, 2006



Total: $4.6 Billion

1. Includes faculty salaries and indirect costs related to research.
Source: Statistics Canada

NSERC does not conduct any research in-house, nor does the organization have any training facilities. NSERC supports research in Canadian universities and colleges that meets the highest international standards of excellence, and it supports the training of young people in that research. As a result, universities, colleges, companies, government agencies and other institutions with which NSERC collaborates are all key co-delivery partners.

More than 11,000 university professors and nearly 25,000 university students and postdoctoral fellows are supported by NSERC. (For a searchable database of all NSERC grant and scholarship recipients see http://www.nserc.gc.ca/funding/funding_dec_e.asp.) The Council also supports a considerable number of university technicians and research associates. Most Canadian universities benefit from NSERC programs, as do a growing number of colleges. Canadian industries and government departments are increasingly

partnering with NSERC. Figure 7 presents the details of NSERC's client support and partnerships. Estimates of the share of the population of eligible individuals and organizations funded or participating, and trends over the past 10 years, are also included.

As the main beneficiaries of NSERC funding, university professors and students are NSERC's key clients. University administrative offices, such as research and scholarship liaison offices, are key partners in ensuring cost-effective NSERC program delivery. Further downstream, university technology transfer offices assist in generating the socio-economic returns at the core of one of NSERC's desired strategic outcomes. In addition, several NSERC programs require the involvement of industry and/or government partners. Some company trends and important government partners are highlighted in Figures 8 and 9.

There are other important partners that also contribute to the fulfilment of NSERC's strategic outcome of the productive use of new knowledge. These partners are typically involved in the intermediate outcomes and include such players as venture capital firms, angel investors, government agencies involved in financing businesses, banks and other partners providing financing and/or advice.

Given the multitude of partners involved, it must be emphasized that the outcomes presented in Section 2 are shared achievements. There is no easy way of isolating the impact of NSERC funding. However, because NSERC funding is the key driver in the early stages of the process and exercises quality control at that stage, it is doubtful that many of these outcomes could occur without it.

Figure 7
NSERC's Clients and Partners, 2006-07

	Number Supported or Participating	Share of the Population[1]	Trends in Share of the Population Over Past 10 Years
Clients:			
University Professors	11,544	75%	Small Increase
Undergraduate Students	8,903	7%	Moderate Increase
Master's/Doctoral Students	13,470	35-40%	Moderate Increase
Postdoctoral Fellows	2,090	40-45%	Small Increase
University Technicians, and Research Professionals	2,756	25-30%	Moderate Decrease
Partner Organizations:			
Universities and Colleges	80	75%[3]	Small Increase
Companies Performing R&D[2]	1,402	10%	Moderate Increase
Federal Science Departments/Agencies[2]	26	80%	Small Increase
Provincial Science Departments/Agencies[2]	23	25-40%	Small Increase

Source: NSERC

1. The percentage that NSERC supports of all individuals and organizations eligible for NSERC funding.
2. Organizations in partnership with NSERC (across all NSERC programs).
3. Percentage only applies for universities.

Companies

Over the past decade, an increasing number of companies have contributed to NSERC's research partnership programs and co-funded students and fellows. More than 1,400 firms participated in NSERC programs in 2006-07.

NSERC is well-known to companies heavily involved in R&D. In 2005-06, sixty-five of the top 100 Canadian R&D companies (as ranked by *RE$EARCH MONEY*, 2006) have collaborated with NSERC to support university research and training. Figure 8 highlights the number of firms by sector of the top 100 Canadian R&D companies participating in NSERC's scholarship and partnership programs.

Figure 8
Top 100 Canadian R&D Companies and Participation in NSERC Programs

	Top 100		Companies Collaborating with NSERC			
	No. of Companies		Number		% of Sector	
Industry Group Sector	2004	2005	2004	2005	2004	2005
Pharmaceuticals/biotechnology	35	37	24	20	68.6%	54.1%
Comm/telecom equipment/services	16	16	10	9	62.5%	56.3%
Energy and Utilities	13	11	12	11	92.3%	100.0%
Electronic parts and components	9	7	7	5	77.8%	71.4%
Software and computer services	9	10	5	3	55.6%	30.0%
Mining, metals, chemicals and forestry	7	8	7	8	100.0%	100.0%
Transportation	7	7	6	6	85.7%	85.7%
Other	4	4	2	3	50.0%	75.0%
Total	**100**	**100**	**73**	**65**	**73.0%**	**65.0%**

Sources: Research Infosource, Canada's Top 100 Corporate R&D Spenders List 2006, NSERC.

Government Departments/Agencies

NSERC is also well known to most federal and provincial science-based departments and agencies. A list of federal and provincial departments and agencies that NSERC collaborated with in 2006-07 is presented in Figure 9.

Figure 9
NSERC's Federal and Provincial Partners, 2006-07

Federal Departments/Agencies	Provincial Departments/Agencies
Agriculture and Agri-Food Canada	Alberta Agriculture, Food and Rural Development
Atlantic Canada Opportunities Agency	Alberta Environment
Canada Border Services Agency	Alberta Research Council
Canada Economic Development (Quebec)	Alberta Sustainable Resource Development
Canadian Grain Commission	B.C. Ministry of Agriculture, Food and Fisheries
Canada Mortgage and Housing Corporation	B.C. Ministry of Forests
Canadian Heritage	Centre de recherche industrielle du Quebec
Canadian Institutes of Health Research (CIHR)	Fonds de recherche sur la nature et les technologies (Quebec)
Canadian Space Agency	Ministry of Environment (Quebec)
Communications Research Centre Canada	Ministry of Agriculture, Food and Fisheries (Quebec)
Communications Security Establishment	Ministry of Natural Resources (Quebec)
Environment Canada	Ministry of Transportation (Quebec)
Fisheries and Oceans Canada	New Brunswick Dept. of Environment and Local Gov't
Health Canada	Nova Scotia Fisheries and Aquaculture
Indian and Northern Affairs Canada	Nova Scotia Dept. of Environment and Labour
Industry Canada	Ontario Ministry of Agriculture and Food
National Defence	Ontario Ministry of Natural Resources
National Research Council Canada	Ontario Ministry of the Environment
Natural Resources Canada	Ontario Ministry of Transportation
Parks Canada	P.E.I. Ministry of Environment and Energy
Public Health Agency of Canada	Saskatchewan Dept. of Environment
Public Safety and Emergency Preparedness Canada	Saskatchewan Highways and Transportation
Public Works and Government Services Canada	Saskatchewan Research Council
Royal Canadian Mounted Police	
Social Sciences and Humanities Research Council of Canada (SSHRC)	
Transport Canada	

Every year, NSERC reviews more than 11,000 applications for new grants and scholarships. In addition, NSERC manages thousands of ongoing grants and scholarships that were previously awarded. Detailed statistics on NSERC applications and awards can be found at: http://www.nserc.gc.ca/about/fact_e.asp.

Departmental Performance

NSERC measures its performance by evaluating its programs of research and training support according to their impact, cost effectiveness and continuing relevance. When reviewing performance of research support programs, it is important to remember that these investments take longer to bear fruit than most other government investments. **The impact of NSERC's investment in research and training in the NSE can be fully assessed only over the long term.** Therefore, the expected results reported in NSERC's Report on Plans and Priorities 2006-07 should be considered as planned results for the future. The performance information presented in this year's DPR is a retrospective look at outcomes resulting from NSERC funding over the past decade, and in some cases even longer.

In recent years, NSERC has been successful in:

- maintaining a strong presence in world science and engineering research by annually supporting over 11,000 of the most creative and productive Canadian university professors;
- supporting the training of approximately 70,000 master's and doctoral students, and young research professionals since 1978, who have found well-paying, productive jobs and who are contributing to Canada's knowledge-based economic sectors;
- supporting the development of new processes and products, some leading to the formation of new companies, all of which contribute significantly to the national economy; and
- introducing new programs to ensure the research community optimises its contributions to Canada's prosperity and competitiveness.

Link to the Government of Canada Outcome Areas

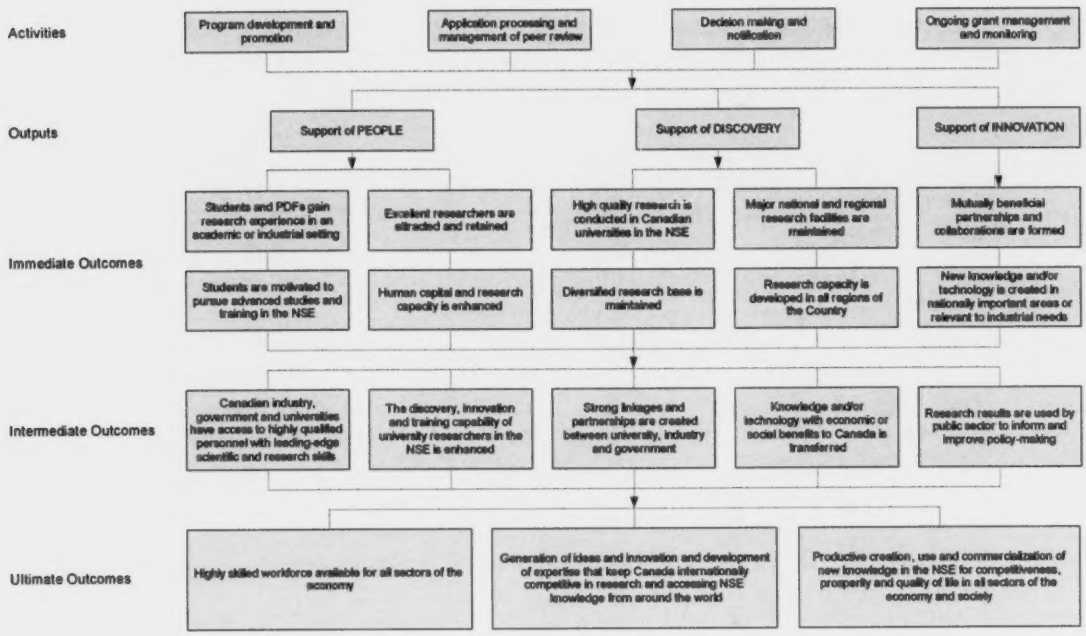
NSERC investments contribute significantly to many of the Government of Canada's strategic outcomes. All of the NSERC-funded outcomes presented in Section 2 are linked to the Government of Canada outcome: an innovative and knowledge based economy. Because NSERC funds research and training leading to a wide-range of economic and societal impacts in virtually every sector, many of NSERC's long-term outcomes are also directly linked to other important Government of Canada outcomes, such as, strong economic growth, income security and employment for Canadians, a clean and healthy environment, healthy Canadians with access to quality health care, and safe and secure communities. It would be a significant challenge to develop performance measures and an attribution methodology for all of these outcomes. For the reason of simplicity, the "innovative and knowledge based economy" outcome is by far the most appropriate single outcome relationship for NSERC to use.

Section 2 – Analysis of Program Activities by Strategic Outcome

NSERC strives to provide Canadians with economic and social benefits arising from the provision of a highly-skilled workforce and knowledge transfer of Canadian and international discoveries in the natural sciences and engineering from universities and colleges to other sectors. In more detailed terms, NSERC's overall performance expectations are highlighted in Figure 10. The performance model presents NSERC's strategic outcomes along with the immediate and intermediate outcomes expected. The pace of realization of immediate and intermediate outcomes will vary with the research projects and students funded, taking from a few years to decades. This progression is also not risk free, with some research projects and students not realizing their full potential. As well, no one indicator can be used to measure a defining accomplishment; rather a whole suite of indicators must be taken into consideration. In addition, many of the immediate and intermediate outcomes shown for the three priority areas overlap.

NSERC invests government funds through a variety of programs with different objectives and complimentary strategic outcome expectations (for example, students are supported through virtually all NSERC programs). All of NSERC's programs achieve a number of immediate and intermediate outcomes. Linking resources to any one expected outcome is, therefore, virtually impossible. Sections 2.1 to 2.3 provide details of the performance measures by strategic outcome and program activity to the best and most reasonable extent currently possible. NSERC along with the other granting councils and Industry Canada will be developing a performance measurement plan in the near future.

Figure 10
NSERC's Performance Model
Natural Sciences and Engineering Research Council Logic Model


Activities
Program development and promotion
Application processing and management of peer review
Decision making and notification
Ongoing grant management and monitoring
Outputs
Support of PEOPLE
Support of DISCOVERY
Support of INNOVATION
Immediate Outcomes
Students and PDFs gain research experience in an academic or industrial setting
Excellent researchers are attracted and retained
High quality research is conducted in Canadian universities in the NSE
Major national and regional research facilities are maintained
Mutually beneficial partnerships and collaborations are formed
Students are motivated to pursue advanced studies and training in the NSE
Human capital and research capacity is enhanced
Diversified research base is maintained
Research capacity is developed in all regions of the Country
New knowledge and/or technology is created in nationally important areas or relevant to industrial needs
Intermediate Outcomes
Canadian industry, government and universities have access to highly qualified personnel with leading-edge scientific and research skills
The discovery, innovation and training capability of university researchers in the NSE is enhanced
Strong linkages and partnerships are created between university, industry and government
Knowledge and/or technology with economic or social benefits to Canada is transferred
Research results are used by public sector to inform and improve policy-making
Ultimate Outcomes
Highly skilled workforce available for all sectors of the economy
Generation of ideas and innovation and development of expertise that keep Canada internationally competitive in research and accessing NSE knowledge from around the world
Productive creation, use and commercialization of new knowledge in the NSE for competitiveness, prosperity and quality of life in all sectors of the economy and society

2.1 Highly Skilled Science and Engineering Professionals in Canada

By supporting students and fellows at Canadian universities and abroad, providing programs to support university faculty, and promoting science and engineering to Canadian youth, NSERC will ensure a reliable supply of highly qualified personnel (HQP) for Canadian industry, government, and academia. The following three sections provide details of NSERC's performance by program activity for the strategic outcome of highly skilled science and engineering professionals in Canada.

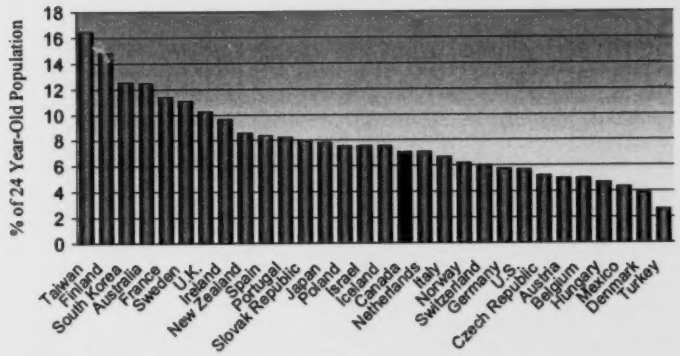
2.1.1 Promote Science and Engineering

An overview of the "promote science and engineering" program activity is presented below:

Description:	This program activity encourages popular interest in science, mathematics and engineering and aims to develop science, mathematics and engineering abilities in Canadian youth.
Expected Results:	The performance indicators to be used to assess the effectiveness of these science promotion programs will be student interest and abilities in science, mathematics and research, as determined through progress reports collected by NSERC.
Planned Spending: **Actual Spending:** **Planned Human Resources (FTE):** **Actual Human Resources (FTE):**	$4.1M $4.0M 2 2
Number of Organizations Supported:	111

Young Canadians are less inclined to select science or engineering as a discipline when they enter university (see Figure 11) as compared to many other nations. To help improve the interest of Canadian youth in science and engineering, NSERC has launched two programs. The key programs under this program activity include PromoScience ($2.7M) and the Centres for Research in Youth, Science Teaching and Learning ($0.9M), with the remaining funds spent on science promotion awards and administration.

Figure 11
Bachelor's Degrees Awarded in the NSE as a Percentage of 24 Year-Old Population, 2002 or Most Recent Year



Source: National Science Foundation, OECD.

The PromoScience program provides support to non-profit and public organizations that work with young Canadians in order to build their interest in science and engineering, motivate and encourage their participation in science and engineering activities, and train teachers who are responsible for the science and math education of young Canadians. NSERC monitors closely the progress of these grants and reviews final reports to ensure impact. A selection of early outcomes from PromoScience grants is presented in Figure 12. The program is allowing organizations to expand their offerings and to engage many more young Canadians, especially girls and aboriginal youth. A potential indicator of the long-term impact of PromoScience funding can be gauged from an exit survey of NSERC Undergraduate Student Research Award recipients (see Section 2.1.2) in which 30% of 10,545 respondents (who are currently enrolled in an NSE bachelor's degree program) took part in science camps or fairs either in elementary school or high school.

The Centres for Research in Youth, Science Teaching and Learning (CRYSTALs) is a pilot program designed to establish effective collaborations between researchers in education with those in science, mathematics and engineering, as well as with the education and science promotion communities. The program was launched in 2004-05 and is slated for an evaluation in 2007-08 to determine early outcomes.

Figure 12
Examples of PromoScience Program Impact

Organization Supported		Impact of NSERC Funding
Actua	Actua is a national charitable organization dedicated to providing young Canadians with positive, hands-on learning experiences in science, technology and engineering.	Actua was able to expand its programs to reach 81 per cent more Aboriginal participants. • In all, 9,354 Aboriginal youth from 73 communities participated in camps and workshops. The group also expanded their all-girls programs. • Actua delivered 48 weeks of all-girls camps and 128 group mentor presentations. • Some 4,200 girls participated. NSERC funding helped provide local training for staff and volunteers and was also used to subsidize participation fees for Aboriginals and girls.
Canadian Association for Girls in Science (CAGIS)	CAGIS is a network of girls, aged seven to 16 who like science, technology, engineering, and mathematics (STEM) and want to learn more. The purpose of CAGIS is to promote, educate and support interest and confidence in STEM among girls.	CAGIS is expanding: • Through regional and school-based chapters, 3,000 girls have participated in the past 14 years. • Members can be found in nine provinces and territories. • 461 new members joined and five new chapters started up over the past three years.
Fédération des cégeps	Science, on tourne! is an annual challenge for college students to invent and build a gadget able to accomplish a very specific task.	The 2006 challenge was held in May: • Some 470 students participated in the event - an increase over the past two years. • More than 50 colleges held a local final. • A national final was held for the best teams from 40 colleges.
Future SET	Future SET is a science, engineering and technology education program founded by Professional Engineers and Geoscientists and Memorial University in 1994 to provide Newfoundland's youth with hands-on exposure to exciting projects.	Registration for Future SET hit record numbers for most programs: • 267 children attended summers camps in July and August. • 90 workshops were delivered to 2,122 students. • 23 workshops were delivered to 402 Girl Guides. This helped the group meet their goal of increased female participation. • 27 bursaries were provided. • Future SET also held a special event in May 2006 for grade five classes to build roller-coasters.

Figure 12
Examples of PromoScience Program Impact (cont'd)

Organization Supported		Impact of NSERC Funding
Let's Talk Science	Let's Talk Science strives to improve science literacy through leadership, innovative educational programs, research and advocacy. They motivate and empower youth to use science, technology and engineering to develop critical skills, knowledge and attitudes needed to thrive in our world.	Let's Talk Science offers in-class workshops: • The group delivered some 6,300 workshops reaching 167,000 youths between the ages of five and 14. • They have 20 different workshops available. These are aligned with curricula in British Columbia, Alberta and Ontario. • Two new workshops were developed along with pre- and post-packages for teachers. The group also offers community workshops: • They held 1,800 science outreach community events reaching some 54,400 youth. Professional development for teachers: • Let's Talk Science offers 14 different workshops for teachers of students from Kindergarten through Grade nine. • In all some 280 teacher workshops were delivered in British Columbia, Alberta and Ontario. Partnership Program: • This program operates in 23 institutions allowing some 1,200 graduate students to share knowledge with more than 45,000 students. • An interactive website was developed to strengthen and streamline volunteer management and graduate student pairings.
Scientists in School	Scientists in School is dedicated to inspiring an excitement for science and technology in children of all ages.	Scientists in School has grown: • They increased the number of children reached from 250,000 to 456,000. • Launched a new branch in Waterloo, Ontario and doubled the size of their Ottawa, Ontario branch. • Regional branches are adding more workshops. • Expanded their annual trip to Newfoundland and Labrador. • Established programs for every classroom on the Quinte Mohawk Reserve. • Translated four of their workshops into French. • Reached more under-represented groups by offering programs at no cost to less privileged classrooms and targeting Aboriginal students. • The group has 77 workshops in all.

2.1.2 Support Students and Fellows

An overview of the "support students and fellows" program activity is presented below:

Description:	This program activity supports training of highly qualified personnel through scholarship and fellowship programs.
Expected Results:	The number of students gaining research and professional experience, the employment and salary levels of award recipients compared to the general population, and the average degree completion rates and time to completion of award recipients compared to the general population.
Planned Spending: **Actual Spending:** **Planned Human Resources (FTE):** **Actual Human Resources (FTE):**	$137.8M $128.0M 53 49
Number of clients supported by NSERC: **Undergraduate Students** **Master's/Doctoral Students** **Postdoctoral Fellows**	 4,191 4,164 679

NSERC provides direct financial support to students from the undergraduate to postdoctoral levels through key programs such as:

- **Undergraduate Student Research Awards ($19.0M)**: Held in university or industry laboratories, this program provides funding for an undergraduate student to spend a four-month work term in a university or industrial research environment. This program is important to help attract the best students to advanced studies and careers in research. It is also an important element of developing research capacity at small universities in Canada that do not have postgraduate degree programs.

- **Postgraduate Scholarships ($83.9M)**: At the master's and doctoral levels, NSERC supports students by providing an annual stipend that enables them to continue to pursue their research interests. Up to four years' support is available over the course of a candidate's graduate studies. Opportunities for study at institutions in Canada and abroad as well as at Canadian industrial laboratories are available. Canada Graduate Scholarships (tenable only at Canadian universities) are awarded to the most outstanding candidates.

- **Postdoctoral and Industrial R&D Fellowships ($19.0M):** These awards provide two years of support to researchers who have completed their Ph.D., and provides them with funds to continue their programs of research. These awards

may be held at any academic institution through a Postdoctoral Fellowship, or at a Canadian company that conducts research through an Industrial R&D Fellowship.

The remaining funds under the program activity were used for the administration of the programs above.

NSERC also funds students and fellows through support provided by an NSERC-funded professor from his or her NSERC grant. More students and fellows are funded through this indirect route (15,400) than through the direct scholarships or fellowship awards (9,000) presented under this program activity. General macro-level economic outcomes for university graduates in the natural sciences and engineering provide ample evidence of the positive outcomes for NSERC-funded students, both directly and indirectly supported.

NSERC conducts several surveys of its scholarship and fellowship winners and is able to assess performance against expected results. In addition, Statistics Canada collects labour market information that provides ample evidence of the successful career outcomes of NSE graduates. The following sections present data from both sources for this program activity.

Undergraduate Student Research Awards:

NSERC provides four-month positions for undergraduate students in the natural sciences and engineering through our Undergraduate Student Research Awards (USRA) program (note: NSERC-funded professors also support undergraduate students through their NSERC research grants). NSERC's current annual investment of $19 million in this program brings this experience to nearly 4,200 students every year. Providing these students with valuable experience in a university or industrial laboratory encourages them to undertake graduate studies. This is an important indicator of the impact of the program. Figure 13 provides outcome data from five surveys conducted with USRA recipients involving 10,545 respondents (62% response rate). Overall, the program is offering students a high quality training experience and is encouraging a significant number to pursue postgraduate studies in the NSE.

Figure 13
Performance Related to NSERC Undergraduate Student Research Awards (USRA)

Short-term Outcomes	❑ Satisfaction is high with the USRA work experience; ❑ Students report learning practical techniques and methods and gaining critical management skills; ❑ Students report that the supervision and instruction they received was excellent; ❑ Students' interest in research increased at a critical period in their career choice; and ❑ USRA work experiences had a significant impact on students' interest in careers in industry;
Longer-term Outcomes	❑ Students overwhelmingly believe their USRA job experience will improve their permanent job prospects; and ❑ A significant number (26%) of students plan to stay in university longer as a result of their USRA job experience.
Recipients' Comment	❑ "The USRA provided me with an excellent experience. It has given me a much greater appreciation of how research is actually conducted than I have received from my undergraduate classroom experience." ❑ "My experience with NSERC USRAs has made me more confident in my aspirations to make scientific research my career." ❑ "I learned more practical lab experience in 16 weeks than I have in my 3 years of university." ❑ "My supervisor was fantastic and taught me a lot about research. This summer has encouraged me to continue in research and made me more aware of the many options available in different disciplines." ❑ "I absolutely loved the research I was able to do under the NSERC award. The program gave me an excellent opportunity to continue in research."

NSERC Postgraduate Scholarships:

NSERC provides scholarship support for Canadians to pursue master's or doctoral degrees in the natural sciences and engineering. These programs support more than 4,100 students annually at a cost of $84 million per year.

The career status of former NSERC-funded master's and doctoral students and the degree to which NSERC funding affects their ability to undertake or continue with their studies are important indicators of the impact of the scholarship support. Over the past ten years, NSERC has completed ten surveys (two exit surveys – 1,680 respondents/68% response rate; and eight follow-up surveys nine years after the award – 1,850 respondents/49% response rate) of directly-funded master's and doctoral students. Some of the key findings related to the short and longer-term outcomes experienced by these students are highlighted in Figure 14. Virtually all of the training objectives of the program are being met and labour market outcomes of the students early on in their careers are very promising.

Figure 14
Performance Related to NSERC Postgraduate Scholarships

Short-term Outcomes	❑ 46% report that NSERC funding was "very important" to their decision to continue to graduate studies; ❑ 96% of the respondents completed the degree (master's or doctoral) for which they received NSERC funding; ❑ Nearly 50% of the students believed that NSERC funding would help them complete their degree faster; and ❑ Average scientific output per student of 1.4 journal publications, 1.2 conference proceedings and 1.2 conference presentations.
Longer-term Outcomes	❑ Graduates experience far less unemployment (approximately 2%) than the national average (approximately 7%); ❑ The vast majority (92%) have found full-time employment. ❑ Incomes are much higher than the Canadian average, with more than 80% earning more than $45,000 a year; and ❑ 69% report their graduate training was "critical" to their current employment.
Recipients' Comment	❑ "NSERC awards supported most of my graduate work. These awards were crucial for a productive PhD and for securing a high profile postdoctoral position at MIT. This was an excellent investment for NSERC as I have now returned to Canada as an assistant Professor and Canada Research Chair." ❑ "I would not have attended grad school without NSERC funding. I am very grateful to the program for funding my studies." ❑ "NSERC was (and is) a key factor in training me and keeping me in Canada. Since that time, I have lead an initiative to bring > $25 million in imaging infrastructure to Halifax (the city in which I was trained). NSERC should be acknowledged for this and the current Discovery Grant I now hold that is training HQP in this area." ❑ "NSERC has been critical to my career, and with the degree I earned through NSERC, I am contributing to Canadian Industry, Defense Research and Academic Research."

Postdoctoral Fellowships:

After a doctoral degree, in many of the NSE fields, a significant proportion of graduates go through additional postdoctoral research training. NSERC directly funds postdoctoral fellows (PDFs) for up to two years to continue their research training. NSERC invested $15 million to support 482 Canadian PDFs in 2006-07.

The career status of former NSERC-funded postdoctoral fellows and the degree to which NSERC funding affects their ability to pursue a research career are important indicators of the impact of the postdoctoral support. Over the past seven years, NSERC has completed four surveys (573 respondents/40% response rate) of directly-funded postdoctoral fellows seven years after their award and one exit survey (150 respondents/65% response rate) after the completion of the award. Some of the key findings from the surveys are presented in Figure 15. NSERC-funded postdoctoral

fellows are actively engaged in research and experience the same positive labour market outcomes as postgraduate students.

Figure 15
Performance Related to NSERC Postdoctoral Fellowships (PDF)

Short-term Outcomes	❑ For 90% of PDFs, NSERC funding was moderately to very important in their decision to continue with their research in an academic environment. ❑ Average scientific output per fellow of 3.6 journal publications, 1.8 conference proceedings and 2.1 conference presentations. ❑ The vast majority of PDF holders felt they received adequate supervision. ❑ 97% of respondents felt that their PDF award would improve their prospects of finding employment in a relevant area; and ❑ More than 75% of PDF holders would repeat their decision to pursue a postdoctoral position after their doctoral degree.
Longer-term Outcomes	❑ 57% of PDF holders obtained faculty positions at universities and now train the next generation of scientists and engineers; ❑ The vast majority (87%) are still engaged in research, either as a university professor, research scientist or engineer; and ❑ Almost 75% of PDFs report their postdoctoral training was critical to their careers.
Recipients' Comment	❑ "The Post-Doctoral program was a great personal benefit in providing the means to establish my own research directions and independence as an academic prior to starting a professorial career." ❑ "NSERC support has been invaluable all our lives, since I first got a grad scholarship in 1990. Keep it up!!" ❑ "The NSERC PDF program was exceedingly important in developing my scientific career as it gave me some 'academic freedom' early in my career. Having my own funding allowed me to join a research lab that I would have been unable to join otherwise. It also allowed me to define my own research objectives while at that laboratory." ❑ "With NSERC funding I had the opportunity to work for a world-class highly-awarded (knighted, in fact) scientist!! This opportunity was more than a dream come true. I learned more in that laboratory in 3 years (I was offered further funding) than I would have anywhere. Also had the chance to meet and learn from dozens of the internationally-recognized scientists. Truly inspiring, motivating, amazing!!!!"

Industrial Research and Development Fellowships:

An important route for doctoral graduates to gain additional research experience is through NSERC's Industrial R&D Fellowships (IRDF) program. The program currently invests approximately $5 million per year to help place 150-200 Canadian Ph.D.s annually in industrial laboratories. This investment has contributed significantly to the number of doctoral graduates working in Canadian industrial labs. More than 20% of Canadian industrial researchers with a Ph.D. have been funded by NSERC through the IRDF program.

To determine if the program is staying on track, NSERC routinely monitors the employment situation of former IRDF winners. Some key findings are presented in Figure 16.

Figure 16
Performance Related to NSERC Industrial R&D Fellowships (IRDF)

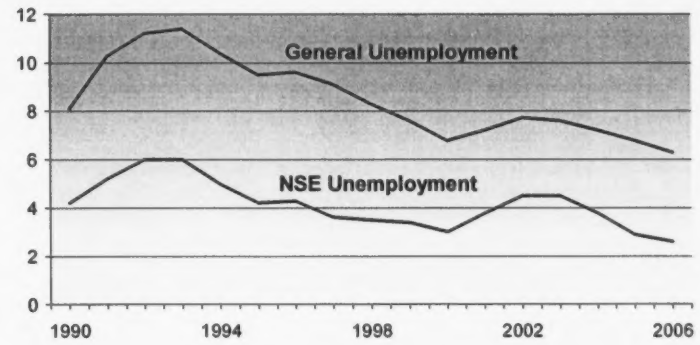
Short-term Outcomes	❑ 75% of former IRDF winners are still working in Canadian industries. A small percentage have gone on to academic positions in Canadian universities and a similar percentage have left the country. ❑ 98% of the firms said that the program was able to meet their requirements. ❑ 98% of the firms stated that the research project undertaken by the fellow was "successful"; and ❑ 94% of the firms believed the research project undertaken was cost-effective.
Recipients' Comment	▪ "This program works very well. It provides an excellent vehicle for new PhD graduates to gain industrial experiences." ▪ "The NSERC fellowship gave me the opportunity to have a true research experience in a leading company such as RIM." ▪ "The NSERC IRDF program helped me gain employment in my field, which other wise may not have happened." ▪ "NSERC IRDF program provides very important financial contributions for fresh PhD graduates to gain previous industrial R & D experience in their careers. I greatly appreciate your support and wish your continuous success." ▪ "I enjoyed it, it was a very valuable experience. Working for such a small company allowed me to be involved with many aspects of the company."

LABOUR MARKET OUTCOMES

Since 1978, NSERC has supported the training of approximately 70,000 master's and doctoral students in the NSE. These graduates are major contributors to knowledge creation and technology transfer in Canada. Surveys of NSERC-funded students early in their careers indicate extremely positive employment outcomes.

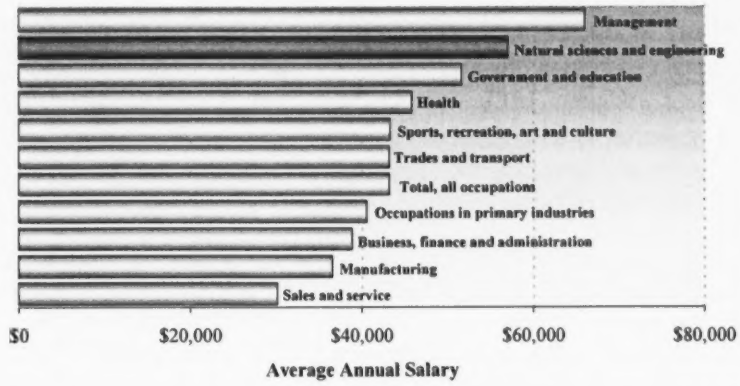
These results are not surprising given the strong demand for natural science and engineering graduates. Unemployment levels for persons employed in natural science or engineering occupations are considerably below national levels (see Figure 17) and annual salaries for this group are nearly 32% greater than the national average (see Figure 18). The income differential for postgraduate degrees is even greater. As shown in Figure 19, average earnings increase for NSE graduates as their degree qualifications improve.

Figure 17
Unemployment Rate (%) for Natural Scientists and Engineers (NSE)



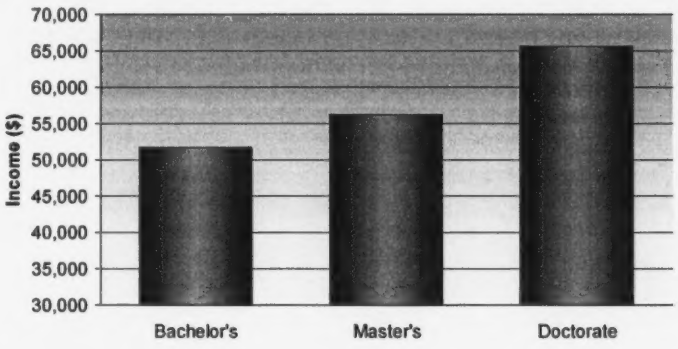
Source: Statistics Canada

Figure 18
Average Annual Salaries by Occupation in Canada, 2006



Source: Statistics Canada. Full-time employment.

Figure 19
Income by Degree Level for Graduates in the NSE, 2001

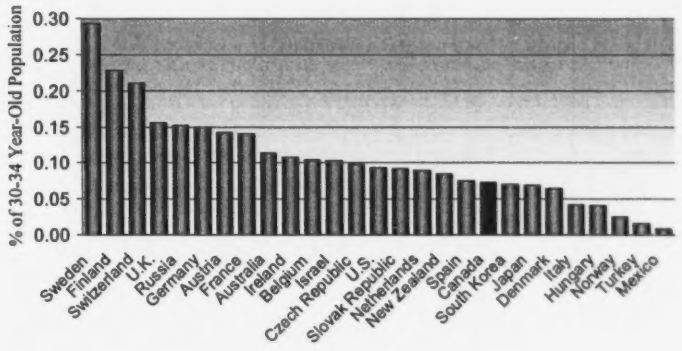


Source: Statistics Canada, Census of Canada 2001

Although the employment and salary prospects for postgraduates in the NSE are very good in Canada, this has not translated into large numbers of doctoral graduates in the NSE. In fact, Canada ranks rather poorly in the per capita production of NSE doctorates as shown in Figure 20. The Canada Graduate Scholarships (CGS) program established in 2003 and subsequently increased as a result of the 2007 federal budget and recent increases to NSERC's base funding may help to improve Canada's ranking. The first cohort of CGS doctoral recipients is expected to graduate in 2007.

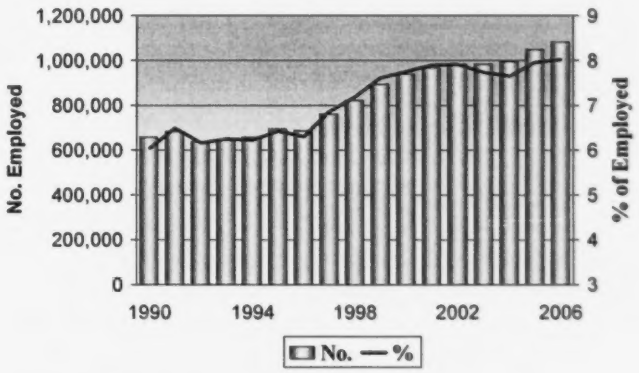
NSERC supports graduate students in the natural sciences and engineering to meet the needs of the country. Without these long-term investments in young people, Canada will experience a decline in its ability to compete and innovate in a knowledge-based world and will be unable to rank highly among top R&D performing countries. As mentioned, approximately 70,000 postgraduates have been funded by NSERC since 1978. These individuals are now part of a growing natural science and engineering labour force of more than 1,000,000 people (see Figure 21). As the knowledge economy continues to grow in Canada, employers will hire increasing numbers of NSE graduates, as they have in the past (see Figure 22). As also shown in Figure 22, natural science and engineering positions have been the fastest growing occupational group over the past 17 years.

Figure 20
Doctoral Degrees Awarded in the NSE as a Percentage of 30-34 Year-Old Population, 2002 or Most Recent Year



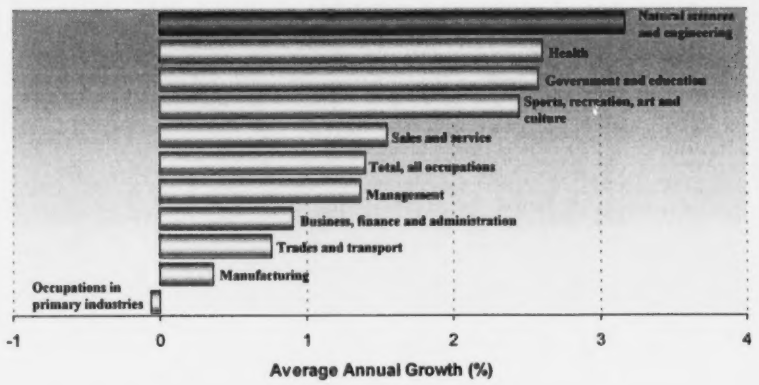
Source: National Science Foundation, OECD.

Figure 21
Number of Workers in Natural Science and Engineering Occupations in Canada (Professional and Technical)



Source: Statistics Canada. Full-time employees.

Figure 22
Average Annual Growth in Occupations in Canada
1990 to 2006



Source: Statistics Canada. Full-time employment.

2.1.3 Attract and Retain Faculty

An overview of the "attract and retain" program activity is presented below:

Description:	This program activity aims to attract and retain faculty at Canadian postsecondary institutions. It includes a number of Chairs programs that strengthen research excellence and teaching at Canadian universities by providing support for faculty in specific fields.
Expected Results:	Faculty support programs will be evaluated based on performance indicators such as the number of researchers attracted to and retained by Canadian universities, the impact of supported faculty on the research teams with whom they work, the number of continuing collaborations established through such support, the number of students and fellows trained by the supported researcher, and the number of patents, publications, and new products developed by supported researchers.
Planned Spending: **Actual Spending:** **Planned Human Resources (FTE):** **Actual Human Resources (FTE):**	$167.7M $145.2M 22 19
Number of clients supported by NSERC: **Professors** **Undergraduate Students** **Master's/Doctoral Students** **Postdoctoral Fellows**	 1,098 250 856 290

Key programs under this program activity include:

- **Canada Research Chairs ($111.2M)**: This Tri-Council (NSERC, CIHR and SSHRC) program provides financial support for up to 2,000 professors across Canada, including 900 positions by 2007-08 within the NSE. The key objective of this program is to enable Canadian universities to achieve the highest levels of research excellence and to become world-class research centres in the global knowledge-based economy.

- **Industrial Research Chairs, Other Chairs and Faculty Support Programs ($29.9M)**: This program helps universities build the critical mass of expertise and long-term relationships with corporate partners in areas of research that are of importance to industry. Industrial Research Chairs can also enhance the ability of universities to recruit senior-level researchers and research leaders from industry or other sectors. The demand for this program has been growing recently.

Support of university faculty in targeted areas such as Northern Research, Management of Technological Change, Fuel Cells, Design Engineering, and Women in Science and Engineering helps address specific needs in particular disciplines. In addition, the University Faculty Awards program seeks to decrease the under-representation of women and aboriginal peoples in faculty positions in the NSE by providing partial salary support to Canadian universities that appoint promising female or aboriginal researchers to tenure-track or tenured positions in science and engineering faculties.

- **Prizes ($1.8M)**: NSERC prizes recognize outstanding Canadian individual researchers, research teams and students. They enhance the career development of outstanding and highly promising scientists and engineers and distinguish the sustained excellence of faculty members of Canadian universities. They also publicly recognize lasting partnerships in R&D between university and industry and celebrate young Canadian entrepreneurs. Examples of NSERC prizes include the Gerhard Herzberg Canada Gold Medal for Science and Engineering, the Brockhouse Canada Prize for Interdisciplinary Research in Science and Engineering, and the Innovation Challenge Awards.

The remaining funds under the program activity were used for administration of the programs above.

By far, the largest program of this program activity is the Canada Research Chairs program. The first awards were made in 2000-01 and by 2006-07 the program supported nearly 800 positions in the natural sciences and engineering in universities, and almost 1,000 in other disciplines. A fifth year evaluation of the program was recently completed (the evaluation was for all disciplines and a copy of the report can be found at: http://www.chairs.gc.ca/web/about/publications_e.asp). Some of the major findings from the evaluation are as follows:

- As of August 2004, 359 Chairholders have been attracted from outside Canada and 84% of Chairholders surveyed (attracted from outside Canada) viewed the Chair award as important in their decision to accept a position in Canada.
- A substantial percentage (23.2%) of Chairholders reported that they would have relocated outside of Canada if they had not received a Chair in the next five years.
- Chairholders cited a substantial increase in the number of students and other HQP supervised since their Chair awards. Chairholders reported that they supervised 779 more doctoral students and 490 more postdoctoral fellows in 2002-2003 than in 1999-2000, a significantly greater increase than other researchers over the same time period.
- Based on the evaluation results, the evaluation consultants concluded that the Canada Research Chairs program has helped to create a research environment that is conducive to the long-term retention and attraction of top researchers. In addition, significant increases in research productivity and in the number of highly qualified personnel being trained at the graduate level were found. Also, Chairholders reported research impacts such as patents, inventions and potential health treatments.

An evaluation of NSERC's Industrial Research Chairs (IRC) program was conducted in 2006-07. Key findings from the evaluation indicate a strong impact on Chairholders and universities in terms of enhanced research capacity and building critical mass. Partners are also benefiting immediately through more unfettered access to longer-term research and specialized expertise with opportunities to share costs and risks associated with conducting longer-term research. More detailed evaluation findings are as follows:

- The majority of partner respondents reported the strongest impacts with respect to increased access to specialized expertise and research results. These impacts are consistent with the partners' expectations of the IRC program. Ongoing access to the Chairholder's expertise was considered to benefit the partner organizations by facilitating the transfer of knowledge/technology with respect to cutting edge research, and potential new processes, products and methodologies for exploring research problems. Moreover, the Chair, through its network of collaborations, provides the partner organization with access to expertise beyond the Chair. According to survey evidence, about half of the partner organizations experienced moderate to strong impacts with respect to increased R&D capacity.

- Survey evidence shows that IRC research is being used by industry, most commonly to improve or develop processes and products (see Figure 23). Additionally, other receptor organizations typically use research results. A comparison of earlier and more recent Chairs revealed that, with the exception of prototype or pilot development, a greater percentage of the earlier Chairs showed evidence of transfer of knowledge/ technology (e.g. increases in the number of patents issued, numbers of technologies licensed, and improved and new processes and products) indicating that commercialization of results is being realized over time.

- The IRC program plays a strong role in strengthening existing partnerships and in creating new partnerships between industrial partners and universities. Sixty-seven (67) percent of industrial partner respondents reported that the existing partnerships with universities have been strengthened as a result of the IRC program. Forty-two (42) percent of all partner respondents reported that their organization had formed new partnerships with university researchers and 31 percent reported that they had formed new partnerships with other organizations as a result of the IRC.

- The IRC program was reported to contribute significantly to the achievement of critical mass and helped to bridge gaps in existing programs or developed niche areas (e.g. automotive sector, environmental science, construction engineering and management). The building of critical mass in industrially relevant areas was linked to a number of the program's features and benefits such as its leveraging

effect, its effectiveness as a tool to recruit and retain faculty (through salary support and increased prestige), and its ability to attract HQP.

- About one-third of industrial partner respondents indicated that they have hired HQP from the program. Survey results indicated that more than two-thirds of HQP who obtain employment are employed by industrial partners and industry upon completion of their involvement with the IRC.

- All lines of evidence supported the assertion that the Chair program contributed substantially to the Chairholder's research capacity (see Figure 24) in terms of increased size of research team, increased ability to attract more qualified personnel, enhanced reputation within the research community, and increased visibility of the research program with industry in general. There was also strong consensus that research was strongly impacted by the IRC program in terms of increased productivity and in terms of an expansion of the research scope.

- According to case study evidence, collaborations with industry also benefit the Chair and its research in the following ways: by helping to keep informed of industrial needs and context; by helping to identify fundamental, long-term research objectives; by providing data for future research and development; by providing a "testing-ground" for tools and knowledge; and by providing feedback on the results of the research.

Figure 23
Knowledge and Technology Transfer (Partner Survey) – IRC Program

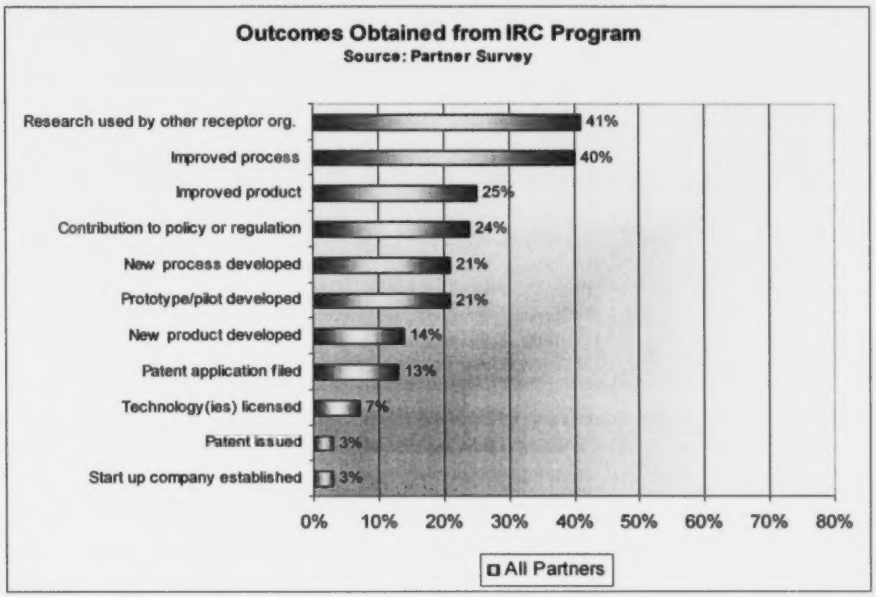
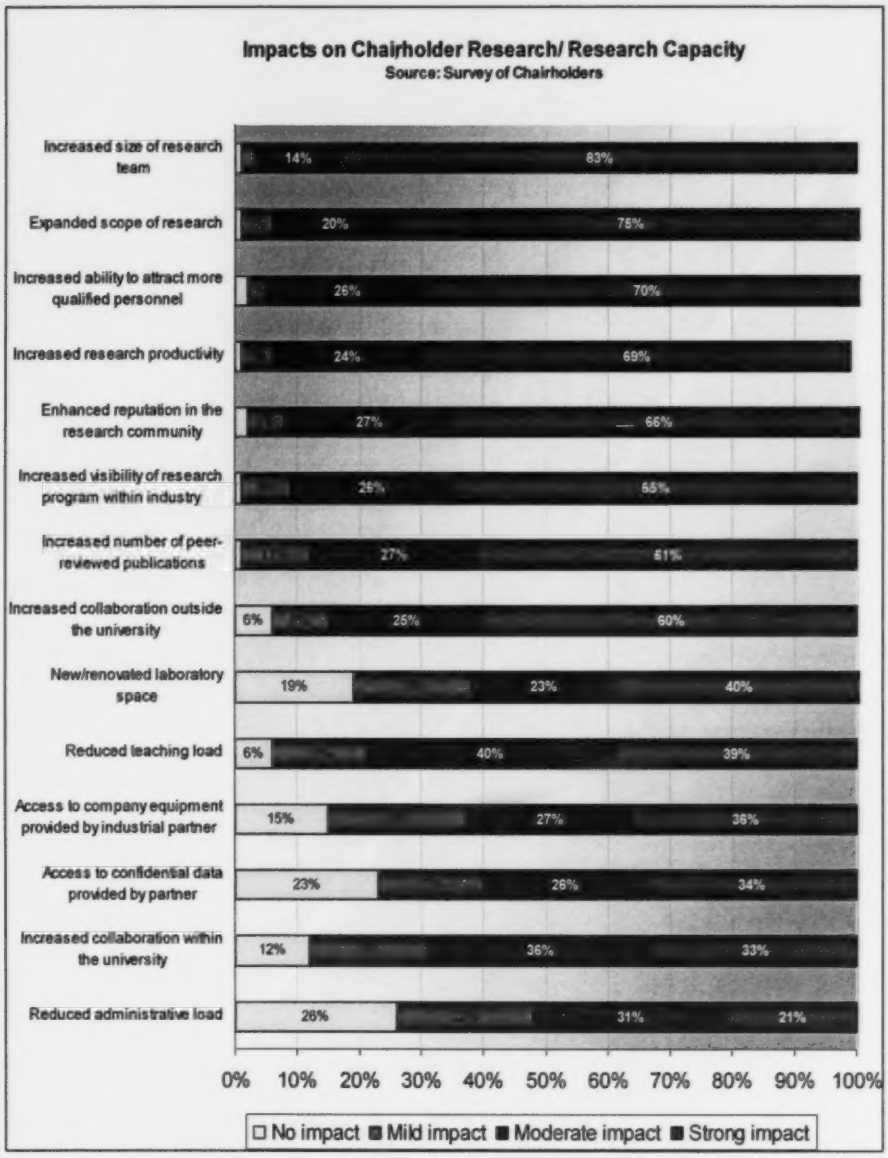


Figure 24
Impacts on Chairholder Research and Research Capacity – IRC Program

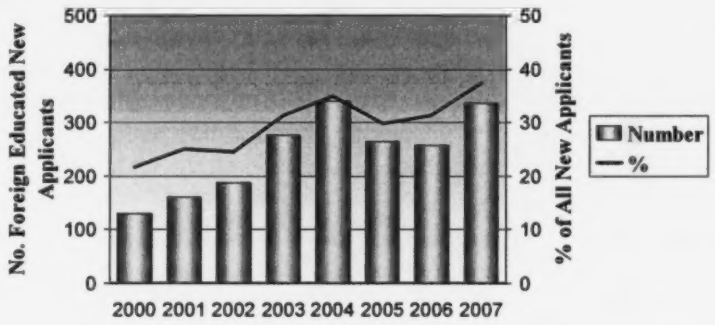


Other evidence of outcomes related to the attraction/retention of faculty comes from NSERC corporate data. Although NSERC does not collect the citizenship history of its applicants, a reasonable guess at citizenship can be made through the education history of applicants. Figure 25 presents the number of new applicants to NSERC's largest program, the Discovery Grants program, who received both their bachelor's and Ph.D. degrees outside the country (this program is a good proxy for an overall evaluation of the "attraction" activity since the vast majority of new professors in the natural sciences and engineering apply to the program). As the figure indicates, Canadian universities continue to attract hundreds of foreign educated personnel every year to become professors. More than 30% of the high number of NSERC new applicants are foreign educated. Recent investment by the government in university research have created an attractive environment to conduct research and seems to have attracted the attention of highly trained people from other countries.

NSERC also tracks the reasons grantees provide when they terminate their awards before the end date. As shown in Figure 26, only a small number of professors receiving NSERC support listed "leaving the country" as their reason for terminating their award over the past eight years. The number of NSERC-funded professors leaving the country is an extremely small percentage of the more than 11,000 professors receiving NSERC support.

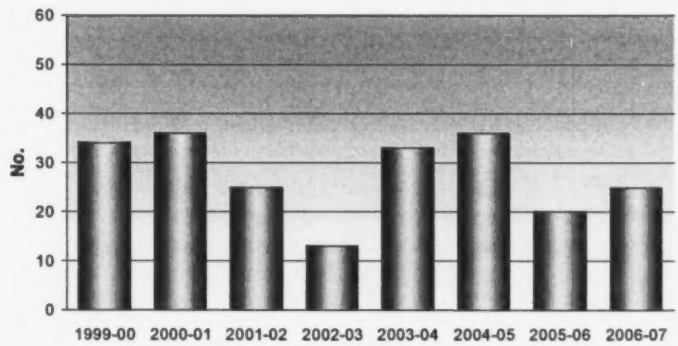
The strong federal support of the granting councils and the Canada Foundation for Innovation (CFI) since 1997-98, and the increased support for university operating budgets from provincial governments has dramatically improved the research environment on university campuses across the country. The success witnessed above in the attraction and retention of faculty can not be attributed to any one program and has resulted from system-wide investments.

Figure 25
Number of Foreign Educated[1] New Applicants to NSERC's Discovery Grants Program



1. Applicants who earned both an undergraduate and Ph.D. degree outside Canada.
Source: NSERC.

Figure 26
Number of NSERC-Funded Professors Leaving the Country



Source: NSERC.

To recognize the important achievements of Canadian research scientists and engineers, and in the process help to retain faculty in Canada, NSERC awards significant research prizes to individuals and teams. The 2006-07 winners of NSERC's Gerhard Herzberg Canada Gold Medal for Science and Engineering and the Brockhouse Canada Prize for Interdisciplinary Research in Science and Engineering are highlighted below.

Richard Bond
Winner of NSERC's Gerhard Herzberg Canada Gold Medal for Science and Engineering

A University of Toronto cosmologist who listens to "cosmic music" is the latest winner of the Gerhard Herzberg Canada Gold Medal for Science and Engineering, Canada's most prestigious science prize. Named for Canadian Nobel laureate Gerhard Herzberg, the annual prize guarantees the winner $1 million in research funding over the next five years.

As Director of the Canadian Institute for Theoretical Astrophysics (CITA) from 1996 to 2006, Bond promoted that organization's mandate for a pan-Canadian approach to world-class science, attracting postdoctoral students from across Canada and the world. He was named an Officer of the Order of Canada in 2005, and is a Fellow of the Royal Society of London and of Canada. With more than 12,000 citations, Bond is Canada's most highly cited astronomer.

For more than 25 years, Bond's research has provided important insights into the deep questions science poses about the origin, history and nature of the universe. By analyzing cosmic microwave background radiation (the oldest light energy that any telescope can detect), he has found ways to sketch details of the events just after the Big Bang that gave the universe its current structure.

Through a combination of theoretical and experimental work, Bond has explored the origin of large-scale structure in the universe, with special attention to dark matter – a major component of the universe that cannot be observed directly but can be detected by its gravitational effect. Over the years he has helped develop cosmology into an increasingly precise science for mapping the size, shape and age of the universe.

Prize-Winning Team Unlocks Secrets of Viruses and Other Biomolecules
Brockhouse Canada Prize for Interdisciplinary Research in Science and Engineering

A team of researchers based at the University of Manitoba, along with their collaborators at MDS Sciex and Agriculture and Agri-Food Canada , have won the third annual Brockhouse Canada Prize for Interdisciplinary Research in Science and Engineering. The prize includes $250,000 in funding for future research activities.

Members of the team have spent more than a decade refining proteomics techniques that can be applied to a wide range of problems in medicine and biology. One of their greatest successes came in 2003 when team members, led by Kenneth Standing, were the first worldwide to determine the structure of the protein component of the Severe Acute Respiratory Syndrome (SARS) virus. Along the way, the team has also developed patented improvements to their key tool, the mass spectrometer.

While genes provide a blueprint, proteins actually carry out the cell's work. Because proteins are so numerous, analysing them is a far more complex process than sequencing a genome.

In addition to Kenneth Standing, the University of Manitoba researchers being honoured with the Brockhouse Prize include chemists Harry Duckworth and Hélène Perreault, physicists Werner Ens and Oleg Krokhin, and cell biologist John Wilkins. Other members of the winning team are Steve Haber, a plant virologist at Agriculture and Agri-Food Canada , and MDS Sciex scientists Igor Chernushevich, Alexandre Loboda and Bruce Thomson.

The involvement of MDS Sciex, a world leader in the design and manufacturing of mass spectrometers, has enabled some of the team's innovations to be incorporated into equipment that is used by researchers around the world.

"This year's winners form a 'virtuous circle' where academic researchers and private sector engineers collaborate to develop the leading-edge equipment needed for new discoveries," said Dr. Fortier. "I'm especially impressed to see the team combine such a wide variety of disciplines, including physics, engineering, chemistry and cell biology."

Named after Bertram Brockhouse, the Canadian Prairie-born Nobel laureate, the prize honours teams of researchers that combine different disciplines to produce achievements of international scientific or engineering significance.

2.2 High Quality Canadian-Based Competitive Research in the NSE

Basic research provides the foundation for all scientific and technological advances, and also trains the people who can generate new knowledge in Canada and understand new knowledge generated around the world.

2.2.1 Fund Basic Research

An overview of the "fund basic research" program activity is presented below:

Description:	This program activity invests in discovery through grants focusing on basic research activities. Basic research provides the foundation for advances in all disciplines within the NSE, and also trains people who can generate new knowledge in Canada. Furthermore, funding for basic research ensures Canada has the capacity to access and understand new knowledge created in other research institutions internationally. This is critical as Canada generates only four percent of the world's new knowledge, as measured by published scientific papers.
Expected Results:	Creation and dissemination of knowledge to the research community and end users, the practical research experience gained by students and fellows who work with supported researchers, the employment of postgraduate students in well-paying jobs, and the diversified intellectual and infrastructure base maintained at postsecondary institutions across Canada.
Planned Spending: **Actual Spending:** **Planned Human Resources (FTE):** **Actual Human Resources (FTE):**	$406.3M $440.8M 124 138
Number of clients supported by NSERC: **Professors** **Undergraduate Students** **Master's/Doctoral Students** **Postdoctoral Fellows**	 10,503 3,590 6,229 693

Key programs under this program activity include:

- **Discovery Grants ($328.3M)**: This program is the mainstay of support for university-based research. The program provides funding for ongoing programs of basic research. These grants recognize the creativity and innovation that are at the heart of all research advances, whether made individually or in groups.

Researchers are free to work in the mode most appropriate for the research area and they may pursue new research interests provided they are within NSERC's mandate. To be funded, they must demonstrate both research excellence and high productivity, and contributions to the training of HQP.

The discovery, innovation and training capability of university researchers in the NSE is enhanced by the provision of support for the direct costs of ongoing programs of basic research.

- **Research Tools and Instruments Grants (RTI) ($50.8M)**: RTI grants enable professors to purchase the laboratory equipment necessary to conduct world-class research. This critical source of funding ensures researchers have access to the modern research tools required to ensure the maximum return on other investments in research, such as Discovery Grants. CFI funding further enhances the laboratory setting by funding major equipment and infrastructure purchases.

- **Major Resources Support (MRS) ($24.1M)**: The MRS program (formerly known as the Major Facilities Access (MFA) program) supports researchers' access to major regional or national research facilities by assisting these facilities to remain in a state of readiness for researchers to use. This program is the vehicle for NSERC investments in facilities such as the Canadian Light Source synchrotron and the Sudbury Neutrino Observatory.

- **Special Research Opportunity (SRO) Grants ($11.1M)**: These grants enable researchers to pursue new and emerging research opportunities at the time they become apparent or investigate and develop new collaborations necessary to respond to national and international opportunities.

  This is particularly important in situations where there is a limited "window of opportunity" to address a particular research interest, such as the opportunity to participate in an international collaborative research effort.

Other programs under this program activity include funding for the Perimeter Institute ($5M), Research Capacity Development in Small Universities ($1.9M), General Support ($1.2M) and funding for the administration of all of the above programs.

The most recent evaluation of the Discovery Grants program can be found at the following site: http://www.nserc.gc.ca/about/aud_eval_e.asp. An evaluation of the RTI and MFA (now named MRS) programs was completed in 2006-07 and is discussed later on in this section.

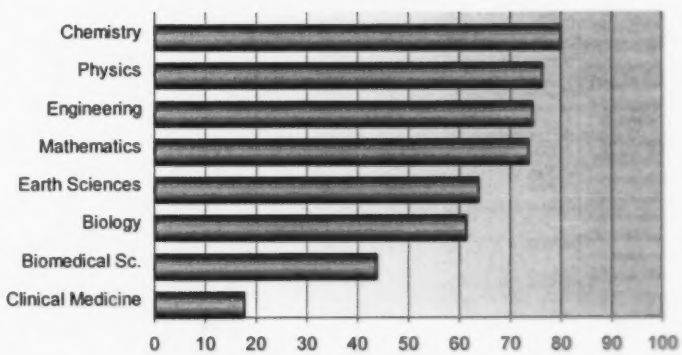
Section 2.1.2 provided a broad perspective on student outcomes for undergraduate and postgraduate students in the natural sciences and engineering. For the remainder of this section, highlights of performance measures related to basic science funding will be presented. The outcomes presented also capture performance from most of NSERC's

other grants programs. As mentioned, it is very difficult to disentangle broad performance measures by NSERC program.

One of the first tangible outcomes of an investment in university R&D is a publication in a scientific or engineering journal. The worldwide culture of university research places a great deal of importance on publishing new discoveries and advances in widely-circulated journals. Investment in this very public forum gives the country's researchers access to the latest international research and the ability to build on this research. Since the vast majority of Canada's and the world's scientific and engineering publications are produced by university researchers, it is a good indicator of the immediate outcome from NSERC research funding.

In a previous comprehensive study of publications and their relationship to NSERC-funded professors (see http://www.nserc.gc.ca/about/bibliometric_e.htm) it was determined that NSERC-funded professors are by far the major contributors to Canada's science and engineering publication output. NSERC accomplishes this by funding a critical mass of professors and students in all disciplines of the natural sciences and engineering. This ensures that Canada has access to world knowledge produced in all fields and that the country's researchers can quickly participate in new emerging areas. When publications were examined by discipline (see Figure 27), it was shown that for nearly every major field NSERC-funded professors were responsible for a majority of publications. For this reason, the review of national output as follows can be correlated to NSERC-funding.

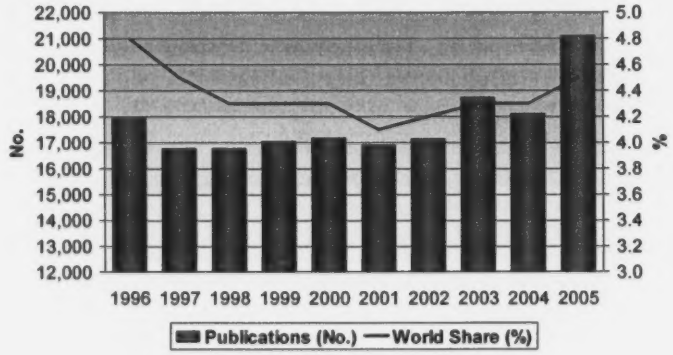
Figure 27
NSERC-Funded Share of Canadian Publications by Field
1996-99 (%)



Source: Observatoire des Sciences et des Technologies

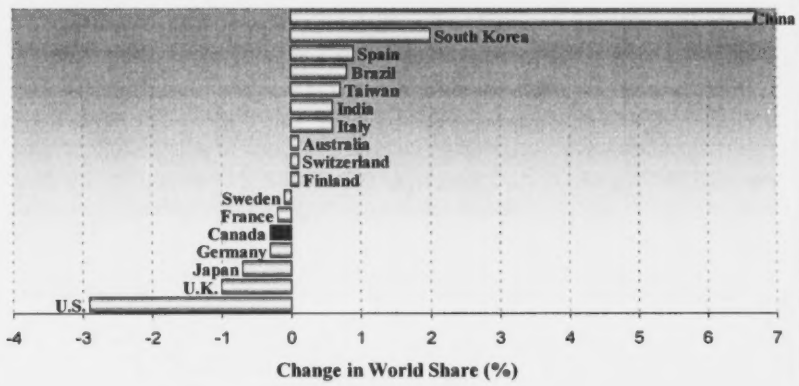
Canada is among an elite group of countries publishing a significant number of articles in science and engineering journals. Canadian researchers (all sectors) in the natural sciences and engineering (NSE) have been publishing roughly 17,000 to 18,000 journal articles per year over the past decade, but this number has jumped to 21,000 papers in 2005 as shown in Figure 28. Overall, Canada's world share of NSE papers has been climbing back since the low of 4.1% in 2001 and now stands at 4.5% in 2005. However, the 2005 figure is still below the 4.8% world share in 1996. As shown in Figure 29, Canada's performance in NSE article production versus many of our major competitors has been similar, as most industrialized countries lose publication share to developing countries such as China, India and Brazil. Since there could be a significant time delay (up to 6 six years) to publishing after an increase in research funding, the upswing of Canada's publications and world share of publications seen in 2005 may be the first signs of the impact of the additional investments in university research over the past several years.

Figure 28
Number of Canadian Publications in the NSE and World Share



Source: Observatoire des sciences et des technologies

Figure 29
Change in World Share of NSE Publications
2005 vs. 1996

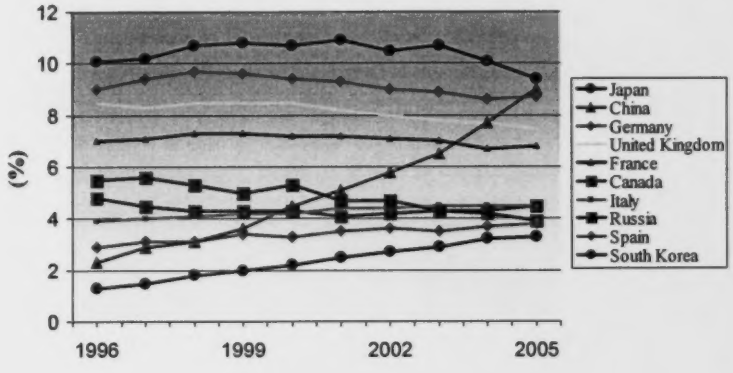


Source: Observatoire des sciences et des technologies

World article production in the NSE has averaged roughly 400,000 articles per year, with a significant increase in 2005 as more journals were included in the dataset. The U.S. dominates publication production with nearly one-third of NSE articles in any given year. The next closest output is from Japan at only one-third the size of the U.S. output (see Figure 30 for world share of NSE publications for the top 10 countries after the U.S.). Canada ranked in 7th position in 2005, improving from its 9th place showing in 2001 to 2003 and remaining in the same spot as in 1996. Over this ten-year period, Canada was overtaken by China in the rankings, while Canada surpassed Russia. Publication output by Spain, India and South Korea are closing in on Canada and their output may surpass Canada's in the next ten years. Canada's world rankings by discipline ranged from 5th spot for biology and earth and space sciences to 12th position in chemistry.

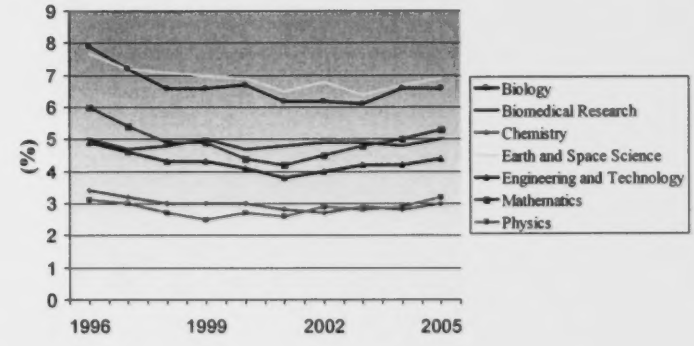
Another important NSERC objective under basic research funding is to maintain a significant presence in all fields of the natural sciences and engineering. As was previously indicated, most of Canada's NSE publications are produced by university researchers funded by NSERC. When publications are examined by discipline (see Figure 31) it can be seen that diversification, for the most part, is being accomplished. (Note: for the biomedical sciences and clinical medicine disciplines the Canadian Institutes of Health Research contributes significantly to publication output.)

Figure 30
World Share of Publications in the NSE for Select Countries



Source: Observatoire des sciences et des technologies.
Excludes the U.S.

Figure 31
World Share of Canadian Publications in the NSE by Discipline

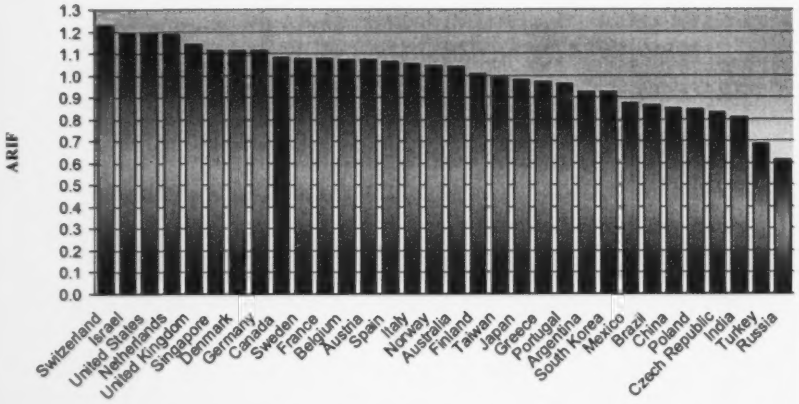


Source: Observatoire des sciences et des technologies

Similar to common rating systems, in which a higher score indicates more viewers, listeners or readers, the impact factor is a measure of the potential use of a researcher's work by fellow researchers. If a researcher's work is being referenced or cited more often by his/her peers, then there may be more intrinsic value to the work. Each scientific journal is rated and assigned an impact factor based on the number of citations the articles appearing in the journal receive. A standardized measure called the Average Relative Impact Factor (ARIF) is then calculated for each country and field and normalized to 1.0. An ARIF value above 1.0 for a country and field means that, on average, the country's publications in that field are cited more often than the world average. An ARIF value below 1.0 would mean that a country is publishing in journals in that field that are not cited as often as the world average.

Figure 32 presents the ARIF values for the top 32 countries (those publishing more than 3,000 articles in the NSE in 2005) in the NSE for 2005. Canada's ARIF in the NSE ranks 9th and is in a tight grouping with the G7, and only significantly behind the top four countries (Switzerland, Israel, U.S. and the Netherlands). The ARIF value falls below 1.0 or the world average, beginning at Taiwan.

Figure 32
Average Relative Impact Factor (ARIF) in the NSE, 2005



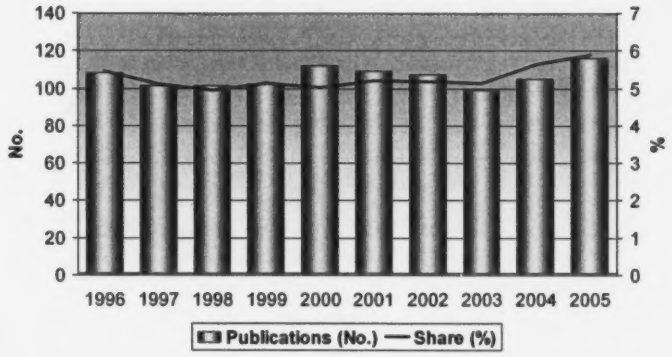
Sources: Observatoire des sciences et des technologies. Only includes countries with at least 3,000 publications in the NSE in 2005.

Publishing in the top journals in a scientific field is a potential indicator of excellence and a complimentary indicator to the average relative impact factor. *Science* and *Nature* are two journals in the natural sciences that are highly influential and widely read. Figure 33 presents the number of Canadian articles and Canada's share of the world total in these journals from 1996 to 2005. Canadian researchers were authors on nearly 6% of articles

appearing in *Science* and *Nature* in 2005. Figure 34 presents a "Science and Nature Index" in which a country's share of *Science* and *Nature* articles is compared to a country's share of publications in the natural sciences (engineering is excluded since it is not a prominent component of *Science* or *Nature*). For example, from 2001 to 2005, the U.S. share of *Science* and *Nature* articles was 2.2 times their share of natural science publications. The corresponding figure for Canada was 1.2. Using this index measure, Canada ranks 8th for the time period in question (the analysis was once again limited to those countries producing more than 3,000 articles in the NSE).

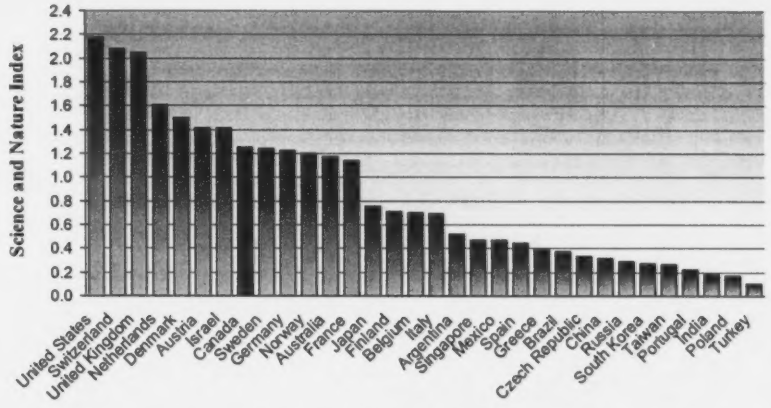
Figure 35 highlights for the most recent time period: 2001-2005, the ratio of a country's world's share of citations in a particular subfield to the country's world share of publications in that subfield. For example, the percentage of citations to Canadian space science publications exceeded Canada's world production of space science papers by 57% in 2001-2005. Canada is only one of three countries to have a positive relative citation impact for all 17 subfields presented.

Figure 33
Number of Canadian Publications in the World's Two Most Prestigious Science Journals, Nature and Science



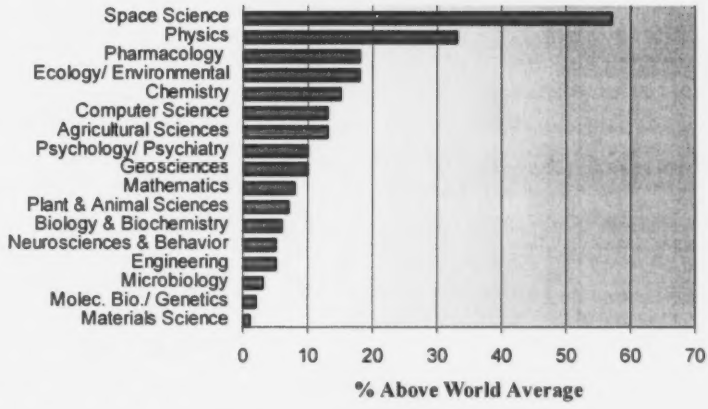
Source: Science Citation Index.

Figure 34
Science and Nature Index[1], 2001-2005



1. World share of Science and Nature publications divided by world share of natural science publications.
Source: Observatoire des sciences et des technologies, Science Citation Index.

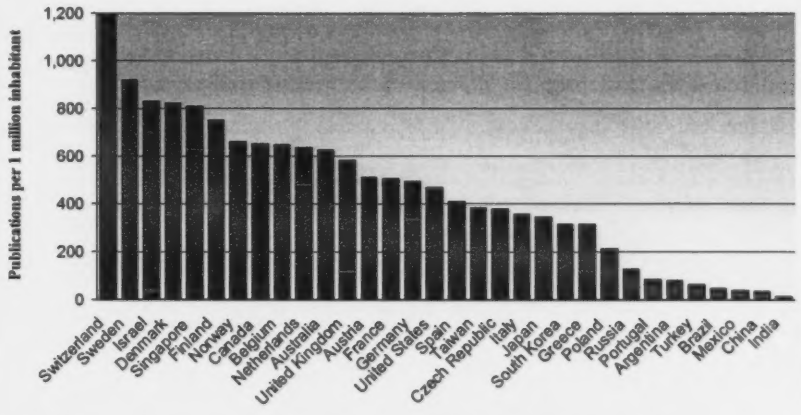
Figure 35
Canada's Relative Citation Impact for Select Subfields, 2001-2005



Source: Thompson ISI. Sci-Bytes.

Indicators of productivity as they relate to scientific publication production can also be useful. One indicator is a measure of a country's output of NSE publications per capita population. Figure 36 present the 2005 per capita output per one million inhabitants for those countries producing a significant number of articles (the cut-off chosen was at least 3,000 articles published in 2005). Using this criterion, Switzerland has the highest per capita output while Canada ranks in 8th position, but ahead of some significant players such as the U.K., France, Germany, United States, Japan and Italy.

Figure 36
Per Capita Output of Publications in the NSE, 2005



Sources: Observatoire des sciences et des technologies, OECD, 2005 CIA World Fact Book.
Only includes countries with at least 3,000 articles in the NSE in 2005.

In many cases the published research funded by NSERC are recognized as significant contributions to world science and engineering. A sample of significant research findings funded by NSERC in the areas of the environment, energy, information and communication technologies, and health are highlighted in Figure 37.

Figure 37
Important Discoveries of 2006-07 Funded by NSERC

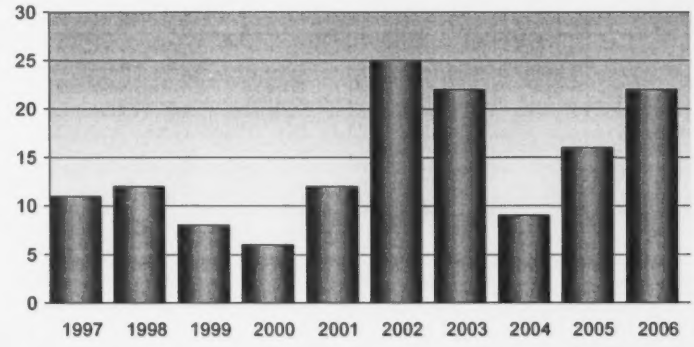
	What	*Where*	*Who*	*How*
Environment	**Arctic melt warning**	McGill University	Bruno Tremblay	By calculating the impact of greenhouse gases and other factors on Northern sea ice, researchers found the predicted time-frame for the disappearance of a year-round Arctic ice cover is now a few decades earlier than the previous forecast.
	Fish stock collapse by 2050	Dalhousie University	Boris Worm	Study shows the catches of 29% of fish and seafood species have already collapsed to less than 10% of their historical maximum. Research shows the rest may soon follow suit as the erosion of marine ecosystems appears to be accelerating.
	Source of chemicals detected	University of Toronto	Scott Mabury	Nearly every living creature on the planet is contaminated with a suspected carcinogen known as perfluorooctanoic acid, or PFOA. Research shows stain-repellents, widely used on fabrics, carpets and paper products, are a significant source of the chemical.
	Climate model's reconstruction of past sheds light on future	University of Calgary	Shawn Marshall	Using a sophisticated climate model, the University of Calgary researcher, along with a team of others, has successfully recreated the last significant period of global warming. The results show this warming caused widespread glacial retreat, sea-level rise and the complete loss of Arctic sea ice during the summer months. This accurate prediction of the past increased the team's confidence in the model's ability to predict future climate change.
Energy	**Advance in hydrogen fuel cells**	University of Windsor	Douglas Stephan	Researchers found a new way to capture and release hydrogen. Their method involves a compound called phosphonium borate, which takes on hydrogen at room temperature, then releases it as temperatures rise above 100 C. This technique may be used to modify existing technologies to store and release hydrogen more efficiently.
	Separating oil and water	Queen's University	Philip Jessop	A chemical developed by the researchers either binds oil and water together or separates them whenever you want it to. Carbon dioxide and air are used to turn the chemical on (for binding together) and off (for separating).

Figure 37
Important Discoveries of 2006-07 Funded by NSERC (cont'd)

	What	*Where*	*Who*	*How*
Information and Communications	**Laser to help with computing bottleneck**	University of Toronto	Ted Sargent	A new paint-on semiconductor laser produces the invisible colours of light needed to carry information through fiber-optics. This could help the computing industry when microchips reach their capacity sometime around 2010.
	Atoms dance to researchers' tune	University of Waterloo	Raymond Laflamme	Raymond Laflamme and colleagues have successfully manipulated the highest number of quantum bits (qubits) – controlling a 12-qubit system – essentially making atoms "dance." If they are successful in building a quantum computer, it would use the many states of an atom in order to process much more information than a traditional computer – and do it more quickly.
	Smarter spam detection on the way	University of Calgary	John Aycock	Trying to stay one step ahead of spammers, researchers have figured out a way to make smarter spam and improve our knowledge of spam detection. The messages would contain abbreviations, personal signatures or misspellings that people would expect to see in e-mail from someone they know – making them more likely to open the messages and infect their computers.
Health	**Help for diabetics**	University of Calgary	Leo Behie	Researchers can now grow human pancreatic cell aggregates. These cells show great promise in treating diabetics. The research team is working on strategies to expand these cells to the quantities necessary for clinical therapy.
	Quick workout as good as a long one	McMaster University	Martin Gibala and Kirsten Burgomaster	A quick, intense workout is just as good for you as daily, moderate exercise. Research shows performing three 20-minute sessions of intense exercise each week gives the same aerobic benefits as doing four to six hours per week of moderate exercise.
	HIV discovery brings hope	Université de Montréal	Rafick-Pierre Sékaly	Researchers have long wondered how HIV defeats the human immune system. Now they found the virus takes advantage of a cellular molecule called PD-1 which renders HIV-specific T cells unable to mount an effective HIV-specific immune response. The researchers also found this effect can be reversed, allowing the PD-1 molecule to become a likely target for HIV immunotherapy.
	Dietary link to autism	University of Western Ontario	Derrick MacFabe, Klaus-Peter Ossenkopp, Donald Cain, Martin Kavaliers, Elizabeth Hampson	The researchers investigated a compound called propionic acid which is found at low levels in wheat and dairy products, and is also produced by some gut bacteria. When this compound was put into the brains of rats, the animals showed a number of symptoms similar to autism: becoming hyperactive, showing repetitive and abnormal behaviours as well as showing signs of social impairment.
	Soil microbes immune to antibiotics	McMaster University	Gerard Wright	Researchers discovered a vast reservoir of soil microbes from farms, forests and urban areas which possess a "stunning" level of resistance to antibiotic drugs. The study found the microbes were not only resistant to medications that have been on Canadian shelves for years, but that they could also resist the effects of new drugs not yet sold in the country.

Awards and prizes are another measure of excellence in the research community. NSERC collects and updates data on 191 international awards and prizes annually. Over the past 10 years. NSERC-funded professors have received roughly 2.5% of the awards and prizes included in the analysis (see Figure 38). This percentage is slightly below the 4-5% of publications attributable to the community. Lower levels of funding available to Canadian "star" researchers, as compared to their American counterparts, may partially explain this difference. Also, a less-aggressive attitude in seeking prizes and nominating our best for them may help to explain the difference.

Figure 38
Number of International Awards and Prizes Won by NSERC-Funded Researchers



Source: NSERC

Dr. Art McDonald
2007 Benjamin Franklin Medal in Physics

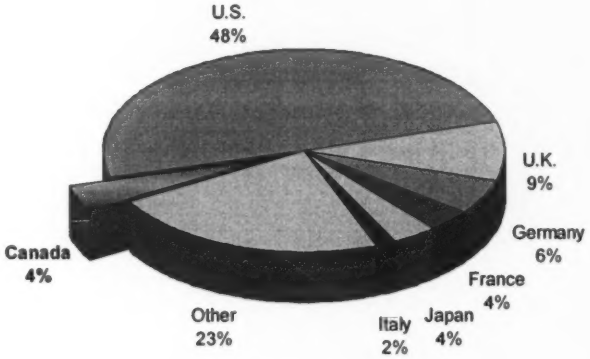
Dr. Art McDonald, Director of the Sudbury Neutrino Observatory Institute, SNO, received the 2007 Benjamin Franklin Medal in Physics awarded by The Franklin Institute.

Dr. McDonald shares this prize with Dr. Yoji Totsuka, Special University Professor Emeritus at the University of Tokyo. The two received the gold medal for finding proof that the Standard Model, one of the most stable theories in 20th century physics, is wrong when it comes to neutrinos. The model states there are three stable kinds of neutrinos: electron, muon and tau. It also says that neutrinos have no mass. McDonald and Totsuka showed that neutrinos aren't stable, instead, they transform from one form to another as they travel, and they do in fact have mass. The list of Franklin Institute laureates includes an impressive number of innovators: Alexander Graham Bell, Pierre and Marie Curie, Thomas Edison, Niels Bohr, Albert Einstein and Stephen Hawking. To date, 105 winners of Franklin Institute prizes have been honoured with 107 Nobel Prizes.

The contributions of established researchers to their fields of study are usually recognized by various awards and honours, such as invitations to give special lectures or to serve on editorial boards of scientific and technical journals and boards of professional societies. On this basis, membership on an editorial board is an indicator of "excellence."

In a study conducted by NSERC, the top 10% of journals in 2005 in each science and engineering discipline were selected as the sample for editorial board membership. Canada ranked fourth in the world in terms of number of researchers serving on the editorial boards of top NSE journals (see Figure 39). The Canadian share of the total number of members of editorial boards was 4%, in line with publication output. The study sample identified 243 Canadian researchers as editorial board members. NSERC-funded board members accounted for 80% of the Canadian share from the university sector.

Figure 39
Journal Editorial Board Membership in the NSE, 2006-07

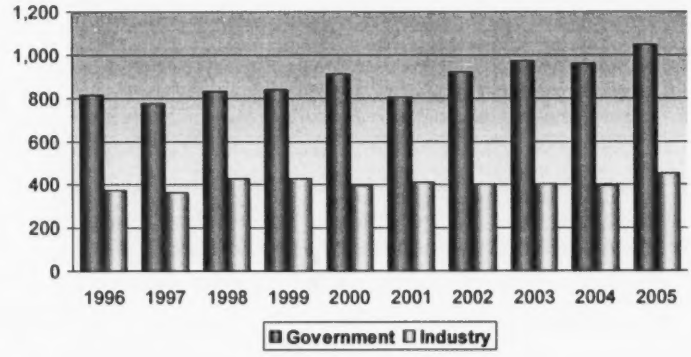


Total: 5,968 Board Members

Source: NSERC

Knowledge dissemination occurs through virtually every NSERC program. The new knowledge created by NSERC-funded university professors is often used by researchers in Canadian industry and government laboratories. One of the first indications of this dissemination to users is through collaborative publications. Figure 40 indicates that over 800 university-government publications and, on average, 400 university-industry publications are produced annually. This trend has been fairly steady over the past decade, although the downturn in Canadian industrial R&D in recent years has also had an impact on the number of university-industry collaborative papers.

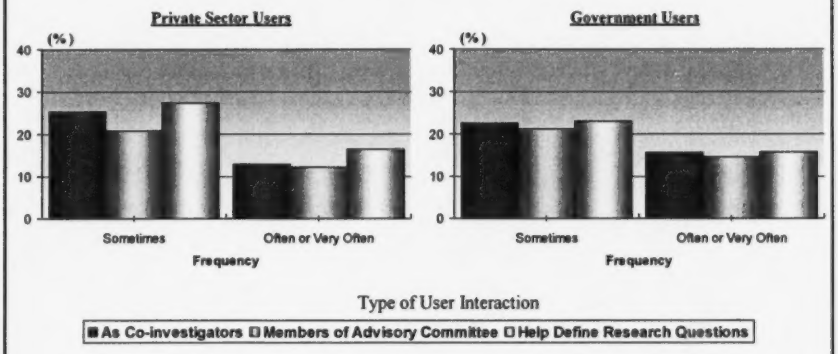
Figure 40
Number of University-Industry and University-Government Publications with NSERC-Funded Professors



Source: Observatoire des Sciences et des Technologies, NSERC estimates.

In 2007, NSERC conducted a survey of NSERC-funded professors (2,590 respondents/45% response rate) to gauge their activities in terms of knowledge dissemination to users (industry and government) and knowledge transfer/commercialization. Figure 41 highlights the percentage of the survey respondents who carried out research with industry or government partners in the last five years, or involved users in helping set the direction of their research programs. A large percentage of the respondents participated in this type of collaborative R&D, ensuring quick knowledge dissemination to users.

Figure 41
NSERC-Funded Professors Interaction with Users
(Users = Private Firms and Government)



Type of User Interaction

■ As Co-investigators □ Members of Advisory Committee □ Help Define Research Questions

Source: NSERC researcher survey 2007.

Also from the survey, Figure 42 presents the frequency with which NSERC-funded professors took user needs into consideration when planning their research projects. To some degree, the majority of professors took into account the needs of users in planning their projects. It must be noted that not all research, especially basic research, has clearly-defined users or applications. Although the majority of respondents engage in a variety of knowledge-dissemination efforts, a minority do not. Improving knowledge dissemination to potential users will be an important goal for NSERC and future surveys will monitor the situation. From the previous knowledge transfer survey (conducted in 2000), respondents mentioned many impediments to knowledge transfer to users. Nearly half of the respondents mentioned lack of expertise of users, lack of firms in the region, lack of academic rewards for dissemination and the pressure to publish as various obstacles to knowledge dissemination.

Figure 43 highlights the frequency with which NSERC-funded professors performed services for private firms related to their research. NSERC-funded professors used a variety of methods to communicate to private firms the results of their research.

Figure 42
Planning Knowledge Dissemination Activities to Users
(Private Firms and Government)

Dissemination Activity by NSERC-funded Professors	Never or rarely (%)	Sometimes (%)	Often or very often (%)
Dedicated time for disseminating research results	14.5	23.8	61.7
Identified what part of their research results they want to disseminate to users	27.0	25.2	47.8
Identified individuals or organizations that could benefit by applying the research results	29.4	31.1	39.6
Dedicated financial resources for disseminating research results	35.0	26.5	38.5
Dedicated human resources for disseminating research results	37.8	24.0	38.2
Identified individuals, organizations or networks through whom they can reach end users of research	37.7	30.4	31.9
Identified specific communication channels for disseminating research results (newsletters, websites, mass media, etc.)	40.6	28.6	30.8

Source: NSERC Researcher Survey 2007

Figure 43
Knowledge Dissemination Activities to Private Firms

Dissemination Activity to Private Firms by NSERC-funded Professors	Never or rarely (%)	Sometimes (%)	Often or very often (%)
Sent my research results directly	49.4	29.8	20.9
Sent technical reports	50.8	28.4	20.8
Gave presentations in a technical seminar organized by the firm	53.0	27.9	19.0
Presented my research results to private firms who could make direct use of them	55.0	27.2	17.8
Provided, without being paid, information or technical support to my former students who worked in private firms (technologies, products, processes)	58.6	26.6	14.8
Provided expertise or technical support, without being paid, to help solve technical problems	58.1	27.3	14.6
Organized seminars or workshops to raise awareness regarding opportunities to apply my research results or research results in my field	68.5	18.2	13.3
Participated in industry expert groups or expert committees that were involved in efforts to directly apply new knowledge including my own research	68.7	20.0	11.3

Source: NSERC Researcher Survey 2007

As previously mentioned, an evaluation of NSERC's Research Tools and Instruments (RTI), and Major Facilities Access Grants (currently called the Major Resources Support (MRS) program) programs was conducted in 2006-07. Some of the major findings from the evaluation are presented below:

- RTI funding leads to more, faster and more in-depth research as well as better trained HQP. These impacts were felt across the spectrum of disciplines, in all regions and in large and small institutions. Small institutions tended to report benefiting more from RTI funding than larger institutions — as long as they were able to secure such funding since data have shown that the probability of funding was less for small institutions than for medium-size and large institutions. These observations support the notion that the RTI program is achieving its objectives to enhance the discovery, innovation and training capability of university researchers.

- Three key messages from this evaluation study were:
    - a significant proportion of the existing equipment infrastructure will require replacement over the coming five years — between one quarter and one third (about $1.5 billion) of the value of existing equipment is at play;
    - about 20% of existing equipment (worth about $1 billion) will require major maintenance over the coming five years; and
    - it is difficult for researchers to find funding for small equipment.

- Due to the amount and nature of the equipment funding, there is currently little overlap between NSERC's RTI program and Canada Foundation for Innovation (CFI) grants. In fact, constraints to usage of CFI (large-scale, state-of-the-art projects within university strategic priorities) make unlikely a dramatic overlap in financial support with RTI/MFA/MRS projects. The current MRS program complements CFI funding on several projects (e.g., Canadian Light Source) by proving the necessary operating and research support to fully utilize the facilities.

- The key impacts of MFA (now called MRS) program were identified as better use of the facilities, increased collaboration among researchers and improved international competitiveness of Canadian researchers. Effects of a grant appear more intense for MFA projects than for RTI projects — be they the positive effects of obtaining a grant or the negative effects of not obtaining it. Increased collaboration among researchers and organizations as well as attraction and retention of faculty are much more prominent effects for MFA than RTI.

2.2.2 FUND RESEARCH IN STRATEGIC AREAS

An overview of the "fund research in strategic areas" program activity is presented below:

Description:	This program activity funds project research of national importance and in emerging areas that are of potential significance to Canada. This program activity addresses all three of NSERC's stated priorities. Such funding opportunities encourage experts in these areas of interest to locate and pursue their research careers in Canada, fostering brain gain. By creating linkages between university, industry and government, and addressing areas of strategic importance to Canada, this funding ensures Canadians reap the benefits of their investments in research. Finally, students and fellows involved in such projects receive excellent training in disciplines of national importance, encouraging the development of Tomorrow's Innovators.
Expected Results:	Research funding leveraged from other partners, knowledge creation and dissemination, experience gained by students and fellows supported through such research and subsequent employment and salary levels, the development of long-term relationships between partners, and the increased collaboration between researchers in different disciplines, and the new knowledge or technologies that result from such interdisciplinary collaborations.
Planned Spending: **Actual Spending:** **Planned Human Resources (FTE):** **Actual Human Resources (FTE):**	\$54.4M \$53.1M 28 30
Number of clients supported by NSERC: **Professors** **Undergraduate Students** **Master's/Doctoral Students** **Postdoctoral Fellows**	 1,079 297 794 186

The key program under this program activity is:

- **Strategic Project Grants (\$44.7M)**: This program accelerates research and training in targeted and emerging areas of national importance. The research is early stage with the potential to lead to breakthrough discoveries. In 2005-06, NSERC redefined the target areas for the next five-year cycle of this program. The areas include: *Advanced Communications and Management of Information Biomedical Technologies, Competitive Manufacturing and Value-Added Products*

and Processes, Healthy Environment and Ecosystems,Quality Foods and Novel Bioproducts, Safety and Security,Sustainable Energy Systems (Production, Distribution and Utilization). These target areas coincide extremely closely to the government's current priority areas of the environment, energy, information and communications technologies, and health.

Other programs under this program activity include funding for the Collaborative Health Research Projects ($3.2M), Innovation Platforms ($1.4M) and funding for the administration of all of the above programs.

In 2006-07, a total of $20.9M was leveraged from partners on Strategic Project grants versus NSERC's funding of $44.7M. The pre-competitive nature of the Strategic Project grants makes the resulting leverage ratio of 47% a better than acceptable result.

In 2004, a five-year follow-up of NSERC's Strategic Project grants was undertaken. Interviews were conducted with a total of 229 Strategic Project grant recipients (66% response rate) and 127 partners (67% response rate) from either industry or government. The margins of error for the two samples are ±5 percentage points for the university researcher sample and ±8 percentage points for the industry sample, with a 95% confidence interval. Some of the highlights from the survey are presented below:

- Almost all respondents indicated that their Strategic Project grant experience had been worthwhile (i.e., 99.6% of university researchers, 95.7% and 100% of industry and public sector partners respectively).
- Highly qualified personnel (HQP) involved in the Strategic Project and estimates of their subsequent employment (when known) are presented in Figure 44.
- In assessing post-award collaboration, a total of 163 researchers (i.e., 71%) indicated that they had continued to collaborate with their strategic project grant partners. This represents 144 researchers (i.e., 64%) who continued working with the same partner(s) in the same area as their strategic project grant, and an additional 19 researchers (i.e., 8%) who indicated that they had continued to work with their partners, but on different projects.
- A large number and variety of publications were generated from the Strategic Project grants studied in the follow-up as listed in Figure 45.
- Figure 46 presents the benefits industry and government partners realized from their participation on the Strategic Project grant.

Overall, the Strategic Projects program is achieving its main objectives and is resulting in significant HQP production and knowledge transfer to the user community.

Figure 44
Number of Highly Qualified Personnel Trained and Number Hired by Category of Employer, 2003

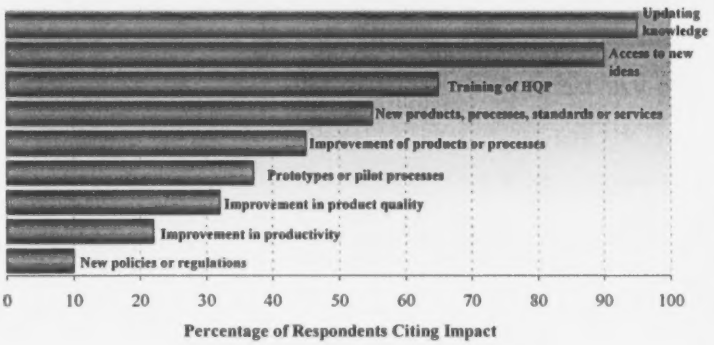
	Number of HQP Trained		Category of Employers (Number of HQP Hired)[1]						
Type of HQP	Total	Mean per Project	Industry partner	Gov't partner	User Sector	Academia	Other	Total	Mean
Graduates (n=228)	561	2.46	32	14	189	13	87	335	1.46
Ph.D. (n=229)	414	1.81	23	11	134	69	43	281	1.22
Postdoctoral Fellow (n=229)	360	1.57	9	11	106	96	49	270	1.18
Technical Personnel (n=229)	224	0.98	-	1	16	19	14	52	0.22
Overall Total	2 249	-	83	44	534	203	233	1 097	-
Overall Mean per project	-	9.82	0.36	0.19	2.33	0.89	1.02	-	4.79

1. HQP hired as known at the time of the survey. Many students were still continuing on with their education.

Figure 45
Number of Publications Resulting from Strategic Projects By Method of Dissemination

Number of publications	Refereed journal articles (n=228) %	Non-refereed journal articles (n=225) %	Theses, related to SPG (n=228) %	Department seminars (n=224) %	Symposia or conferences (n=228) %	Technical reports (n=223) %
None	2.6	70.2	5.3	8.5	1.8	47.5
1	5.3	6.7	13.2	3.6	3.9	9.4
2	8.3	7.6	24.1	13.4	7.5	15.7
3	12.7	4.9	18.0	10.7	11.8	9.9
4 or more	71.1	10.7	39.5	63.8	75.0	17.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
Total publications	1 643	268	889	1 561	2 250	502
Mean number per project	7.20	1.19	3.90	6.97	9.87	2.25

Figure 46
How Partners Used Results from an NSERC Strategic Project Grant



Source: NSERC

2.3 Productive Use of New Knowledge in the NSE

Wealth is created when Canadians add value in producing goods and services that are sold in world markets and knowledge is the modern basis for adding value. NSERC aims to maximize the value of public investments in research for the benefit of all Canadians by promoting research-based innovation, university-industry partnerships, technology transfer activities and the training of people with the required scientific and business skill sets to create wealth from new discoveries in the NSE.

2.3.1 Fund University-Industry-Government Partnerships

An overview of the "fund university-industry-government partnerships" program activity is presented below:

Description:	This program activity fosters collaborations between university researchers and other sectors, including government and industry, in order to develop new knowledge and expertise, and to transfer this knowledge and expertise to Canadian-based organizations. This activity supports NSERC's priority of realizing the benefits of public investments in research by creating productive collaborations between university researchers and the industrial receptors who are able to create value from new discoveries.
Expected Results:	Research funds leveraged from partners, knowledge creation and dissemination to research community and users, experience gained by students and fellows and subsequent employment and income levels, long-term relationships established between partners, numbers of patents and licences generated, and economic value of intellectual property generated through funded research.
Planned Spending: **Actual Spending:** **Planned Human Resources (FTE):** **Actual Human Resources (FTE):**	$115.2M $112.3M 78 59
Number of clients supported by NSERC: **Professors** **Undergraduate Students** **Master's/Doctoral Students** **Postdoctoral Fellows**	 2,425 550 1,379 222

The key programs under this program activity are:

- **Collaborative Research and Development Grants ($47.9M)**: This program gives companies operating from a Canadian base access to the unique knowledge, expertise and educational resources available at Canadian postsecondary institutions and offers opportunities for mutually beneficial collaborations that result in industrial or economic benefits to Canada. It also facilitates world-class research and ensures a strong source of well-trained graduates. Funding for the Canadian Microelectronics Corporation ($9.7M) is included under this activity.

- **Networks of Centres of Excellence (NCEs) ($40.2M)**: The Networks of Centres of Excellence are unique partnerships among universities, industry, government and not-for-profit organizations aimed at turning Canadian research and entrepreneurial talent into economic and social benefits for all Canadians. These nationwide, multidisciplinary and multi-sectoral research partnerships connect excellent research with industrial know-how and strategic investment. They create a critical mass of research capacity by networking researchers and partners across Canada.

- **Strategic Network Grants ($12.1M)**: This program funds large scale, complex research programs that involve multi-sectoral collaborations on a common research topic. The topic to be investigated can be of local concern, requiring a focused local network, or of regional or national importance, requiring a larger, more complex network.

- **Research Partnership Agreements ($4.2M)**: A number of initiatives have been established through the Research Partnership Agreements signed with several federal government departments and agencies. The objective of these programs is to build strong linkages between the private sector, researchers in universities, and researchers in federal institutes. NSERC has agreements with Agriculture and Agri-Food Canada, the Department of National Defence, the Canadian Forest Service (in collaboration with SSHRC) and the Earth Sciences Sector of Natural Resources Canada.

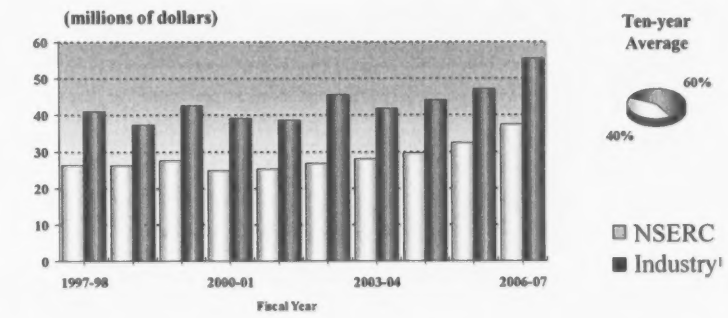
Funding for the administration of the above programs rounds out the spending under this program activity.

Section 2.1.2 provided a broad perspective on students outcomes for postgraduate students in the natural sciences and engineering, while Section 2.2.1 presented results on basic research outcomes. For the remainder of this section, specific program outcomes as well as general performance measures related to technology transfer will be presented. The general outcomes presented in this section also result from investments made in most of NSERC's other grants programs. As mentioned, it is very difficult to disentangle broad performance measures by NSERC program. The outcomes presented in this section usually take longer to become reality than the outcomes in the previous sections. Most of the expected results are part of the technology transfer process. This process can be described as the movement of ideas, tools and people from university professors and

students supported by NSERC to the private and public sector. This movement leads to socio-economic benefits for Canadians as a result of NSERC research support.

The Collaborative Research and Development (CRD) program is intended to give companies operating from a Canadian base access to the special knowledge, expertise and educational resources at Canadian postsecondary institutions and to offer opportunities for mutually beneficial collaborations that result in industrial or economic benefits to Canada. Bringing university professors and Canadian firms together is one of the first methods of stimulating technology transfer. These industrial partners also contribute financially to these university research projects. Because of the socio-economic impacts of university research, NSERC views any additional investment in university research as a positive impact on the Canadian economy. Many of NSERC's programs, especially the CRD program, require a contribution from industry and are often complemented by additional contributions from universities and government departments and agencies. A comparison of NSERC funding to industry contributions for the CRD program is presented in Figure 47. Over the past decade, industrial contributions to the CRD program have outpaced NSERC's investment by over 50%, demonstrating the value Canadian industries place on university R&D and the training of students.

Figure 47
Contributions to NSERC's Collaborative R&D Grants (CRD) Program

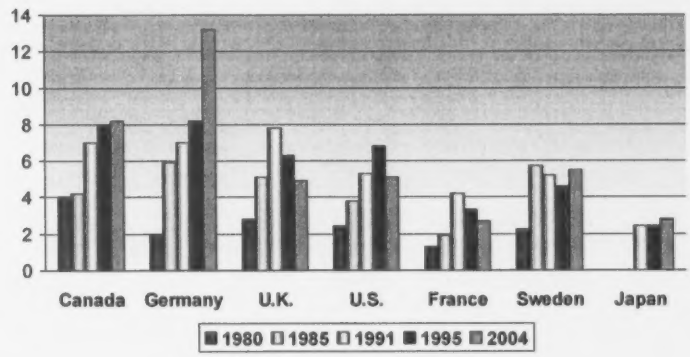


1. Best estimate.
Source: NSERC.

From a more global perspective, the impact of NSERC's partnership programs has been to increase the share of university research funding from industry to levels well beyond

most industrialized nations (see Figure 48). The partnership programs of CIHR also contribute to this total.

Figure 48
Share of University Research Funded by the Private Sector (%)

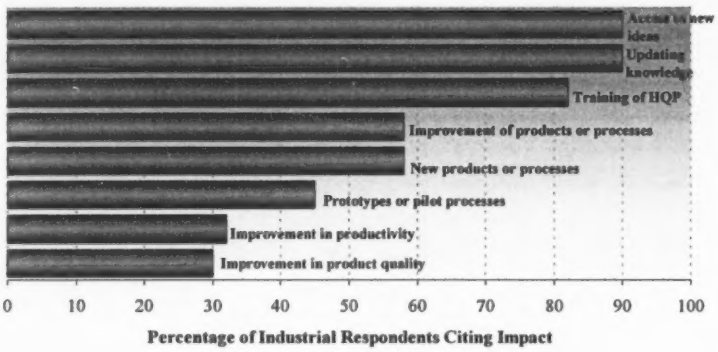


Source: OECD

NSERC tracks the outcomes of its Collaborative Research and Development (CRD) program by following-up with partners two years after the completion of a grant. Results from the last survey of the industrial participants' perceptions of their CRD experience and outcomes are described below:

- The vast majority of both university and industry partners felt that their partnership on the CRD project was successful (i.e., 91% and 94% of university and industry respondents respectively).
- Of the 135 projects studied to date, 87% of the industrial partners felt that the research objectives of the project had been achieved.
- An estimated total of 783 students and postdoctoral fellows participated in the 135 CRD projects sampled for the two-year follow-up (with a mean of 6.53 HQP per project).
- A total of 46 patents and 35 licences have so far been issued with respect to the 135 projects examined. According to the industrial partners, commercializable results were achieved for 39% of the projects.
- Figure 49 shows how often and for what purpose the industrial partners used the research results generated by the CRD project.

Figure 49
How Industrial Partners Used Results from an NSERC Collaborative Research and Development Grant



Source: NSERC

Additional evidence of industrial use of knowledge generated by the university sector comes from a Statistics Canada survey of manufacturing firms related to issues of innovation conducted in 2005 (see the following site for more information on the survey http://www.statcan.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=4218&lang=en&db=IMDB&dbg=f&adm=8&dis=2). For the respondent firms that are considered "innovative", Figure 50 presents the sectors/mediums that provided information for new innovation projects, contributed to the completion of existing innovation projects or provided information for the commercialization of innovation during the three years, 2002 to 2004. The relative importance of the source of information is also highlighted. Universities and scientific journals (dominated by academic publications) are important sources of information for innovative firms in many sectors (e.g. pulp and paper, petroleum and coal, pharmaceutical, navigational and medical instrumentation, and information and communications technologies).

NSERC has initiated a new system to collect information from final reports related to the Collaborative Research and Development program, and will report on performance data collected in future DPRs.

Figure 50

Sources of Information for Manufactring Plant Innovation[1] (2002 to 2004 - percentage of innovative plants)

Sector	Universities				Scientific/Trade/Technical Journals				Federal Gov't Labs				Provincial Gov't Labs			
	Degree of importance				Degree of importance				Degree of importance				Degree of importance			
	High	Medium	Low	Not relevant	High	Medium	Low	Not relevant	High	Medium	Low	Not relevant	High	Medium	Low	Not relevant
	percent				percent				percent				percent			
Logging	0.0	5.0	22.1	72.9	0.0	19.0	55.2	25.7	0.0	0.0	27.1	72.9	0.0	0.0	27.1	72.9
Manufacturing	3.8	10.6	30.8	54.7	8.5	26.8	36.4	28.3	1.3	5.1	28.8	64.8	1.0	4.5	28.5	66.0
Food manufacturing and beverage and tobacco product manufacturing	8.1	13.1	38.7	40.1	2.6	31.4	39.7	26.3	3.0	8.5	37.3	51.2	3.2	8.4	38.8	49.7
Textile mills and textile product mills	1.6	13.9	35.5	49.0	5.5	33.1	44.5	16.8	1.4	12.9	31.2	54.5	0.0	8.3	30.3	61.4
Clothing manufacturing and leather and allied product manufacturing	0.9	6.1	20.7	72.3	7.7	22.8	32.0	37.6	0.4	7.8	14.5	77.3	0.4	6.9	15.4	77.2
Wood product manufacturing	0.6	5.0	39.8	54.6	3.5	23.4	37.8	35.4	1.4	6.3	27.1	65.2	0.3	4.8	32.5	62.4
Sawmills and wood preservation	0.0	7.0	52.9	40.1	3.8	32.2	35.0	28.9	0.0	13.4	31.5	55.0	0.0	6.1	52.5	41.4
Veneer, plywood and engineered wood product manufacturing	0.0	6.6	37.3	56.1	5.8	24.0	56.8	13.5	0.0	4.6	25.0	70.5	0.0	7.8	23.8	69.3
Other wood product manufacturing	1.2	3.0	31.1	64.6	2.5	16.7	33.5	47.4	2.8	1.6	24.6	70.9	0.7	2.9	21.1	75.3
Paper manufacturing	4.4	9.8	33.0	52.8	10.8	27.9	32.2	29.1	0.7	3.0	31.5	64.8	1.3	3.5	29.1	66.0
Pulp, paper and paperboard mills	12.4	20.0	38.6	29.0	12.1	38.4	32.7	16.7	2.3	7.5	40.3	49.9	4.1	9.2	38.6	48.1
Converted paper product manufacturing	0.5	5.0	30.4	64.0	10.2	22.9	31.9	35.0	0.0	0.9	27.3	71.8	0.0	0.9	24.7	74.4
Printing and related support activities	1.2	2.7	22.8	73.4	7.7	41.1	24.7	26.5	0.0	1.7	18.2	80.1	0.0	0.9	18.2	80.9
Petroleum and coal products manufacturing	14.0	8.5	34.1	43.4	12.0	34.1	39.9	13.9	0.0	4.4	28.1	67.5	0.0	0.0	31.4	68.6
Chemical manufacturing	6.1	16.5	35.1	42.3	13.3	29.9	31.1	25.6	1.1	6.4	35.6	56.9	0.9	4.8	37.8	57.0
Chemical manufacturing (excluding pharmaceutical and medicine manufacturing)	4.4	17.0	36.2	42.5	13.5	28.6	31.2	26.6	1.3	5.7	34.6	58.3	1.0	4.9	36.9	57.2
Pharmaceutical and medicine manufacturing	15.2	14.2	29.4	41.2	12.3	36.9	30.4	20.4	0.0	9.9	40.8	49.3	0.0	3.0	41.3	55.7
Plastics and rubber products manufacturing	2.2	14.8	27.7	55.3	12.2	25.7	31.8	30.3	1.8	7.0	23.9	67.4	1.9	7.8	23.0	67.3
Non-metallic mineral product manufacturing	0.9	6.3	35.7	57.0	6.2	23.2	45.9	24.7	1.0	3.2	37.2	58.5	0.3	2.8	35.0	61.9
Primary metal manufacturing	9.5	6.5	43.3	40.7	6.2	40.8	33.4	19.5	0.7	8.5	34.1	56.8	0.0	8.3	29.7	62.0
Fabricated metal manufacturing	3.4	9.7	21.7	65.1	10.4	19.7	35.6	34.3	1.4	1.4	27.1	70.2	1.1	2.0	23.4	73.6
Machinery manufacturing	3.8	12.5	28.8	54.9	7.4	19.3	45.4	27.9	1.3	3.1	33.5	62.1	1.1	2.5	31.2	65.2
Machinery manufacturing (excluding commercial and service industry machinery manufacturing)	3.7	12.3	29.5	54.6	7.0	19.3	45.6	28.1	1.2	3.2	34.4	61.3	1.2	2.4	32.1	64.3

1. Percentage of plants using sources of information that provided information for new innovation projects, contributed to the completion of existing innovation projects, or provided information for the commercialization of innovation during the three years, 2002 to 2004.
Source: Statistics Canada, Survey of Innovation, 2005.

Figure 50

Sources of Information for Manufactring Plant Innovation[1] (2002 to 2004 - percentage of innovative plants) - Continued

Sector	Universities				Scientific/Trade/Technical Journals				Federal Gov't Labs				Provincial Gov't Labs			
	Degree of importance				Degree of importance				Degree of importance				Degree of importance			
	High	Medium	Low	Not relevant	High	Medium	Low	Not relevant	High	Medium	Low	Not relevant	High	Medium	Low	Not relevant
	percent				percent				percent				percent			
Commercial and service industry machinery manufacturing[r]	5.3	14.7	21.5	58.5	12.7	18.2	42.9	26.2	2.5	2.1	22.9	72.5	0.0	3.6	20.6	75.9
Computer and electronic product manufacturing	7.2	17.0	36.6	39.3	14.3	40.6	35.5	9.6	3.2	10.4	33.2	53.2	1.4	5.9	34.4	58.3
Computer and peripheral equipment manufacturing[r]	4.3	17.1	39.7	38.9	8.7	31.6	52.3	7.4	0.0	2.1	36.4	61.5	0.0	6.6	29.5	63.9
Communications equipment manufacturing	3.9	22.0	40.2	33.9	9.4	50.2	32.1	8.3	4.4	14.8	32.1	48.7	1.5	7.4	36.5	54.6
Telephone apparatus manufacturing[r]	4.8	15.2	43.8	36.2	0.0	24.8	56.2	19.0	9.5	0.0	35.2	55.2	0.0	0.0	35.2	64.8
Radio and television broadcasting and wireless communications equipment manufacturing[2]	2.5	26.9	49.2	21.5	15.8	55.3	23.1	5.8	4.2	15.9	39.4	40.6	2.5	5.1	46.8	45.7
Other communications equipment manufacturing	7.3	14.6	9.8	68.3	0.0	61.0	34.1	4.9	0.0	26.8	7.3	65.9	0.0	22.0	7.3	70.7
Audio and video equipment manufacturing[r]	0.0	8.3	25.0	66.7	16.7	33.3	33.3	16.7	0.0	16.7	33.3	50.0	0.0	16.7	50.0	33.3
Communications equipment manufacturing and audio and video equipment manufacturing	3.5	20.6	38.6	37.3	10.2	48.4	32.2	9.2	4.0	15.0	32.2	48.8	1.3	8.4	37.9	52.4
Semiconductor and other electronic component manufacturing[r]	5.5	15.9	37.2	41.4	24.2	37.3	23.0	15.5	1.6	5.4	36.0	57.0	3.1	1.5	31.2	64.2
Navigational, measuring, medical and control instruments manufacturing	11.5	15.8	35.7	37.0	12.6	40.6	39.4	7.4	4.9	13.8	31.7	49.6	0.8	7.2	36.6	55.4
Navigational and guidance instruments manufacturing[r]	17.8	17.2	27.8	37.2	16.8	27.8	48.3	7.2	17.2	18.8	35.0	29.0	4.1	3.7	55.0	37.2
Measuring, medical and controlling devices manufacturing[r]	10.1	15.5	37.5	37.0	11.7	43.6	37.3	7.4	2.2	12.6	30.9	54.3	0.0	8.0	32.5	59.6
Manufacturing and reproducing magnetic and optical media	0.0	15.5	17.5	67.0	0.0	47.5	52.5	0.0	0.0	7.3	25.7	67.0	0.0	7.3	25.7	67.0
Navigational, measuring, medical and control instruments manufacturing and manufacturing and reproducing magnetic and optical media	10.7	15.8	34.4	39.2	11.7	41.1	40.3	6.8	4.6	13.3	31.3	50.8	0.7	7.2	35.9	56.3
Electrical equipment, appliance and component manufacturing	4.8	9.4	30.7	55.1	10.7	28.2	42.8	18.3	0.0	4.2	29.0	66.8	0.4	1.9	29.5	68.2
Electrical equipment, appliance and component manufacturing (excluding communication and energy wire and cable manufacturing)	5.4	10.3	29.7	54.6	11.2	26.8	43.2	18.8	0.0	3.6	29.9	66.6	0.5	1.6	30.2	67.7
Communication and energy wire and cable manufacturing[r]	0.0	3.5	37.7	58.8	6.8	37.9	40.5	14.7	0.0	8.7	22.6	68.6	0.0	3.5	25.1	71.4
Transportation equipment manufacturing	3.8	14.5	34.1	47.6	10.3	24.8	35.8	29.1	0.0	4.0	29.2	66.8	0.0	3.7	28.8	67.5
Transportation equipment manufacturing (excluding aerospace product and parts manufacturing)	3.6	15.4	34.7	46.2	12.0	24.6	33.8	29.7	0.0	3.2	30.3	66.6	0.0	2.9	31.1	66.1
Aerospace product and parts manufacturing	4.8	9.0	30.6	55.6	0.0	26.6	48.0	25.4	0.0	9.0	22.6	68.5	0.0	9.0	15.1	75.9
Furniture and related product manufacturing	0.2	9.7	25.9	64.2	10.7	27.1	29.2	33.0	0.0	3.0	16.3	80.7	0.0	3.6	17.2	79.2
Miscellaneous manufacturing	3.4	6.7	27.4	62.6	9.5	23.0	33.6	34.0	0.8	4.9	24.1	70.3	0.3	4.8	23.9	71.1
Information and communication technology (ICT) manufacturing industries	6.7	16.0	35.8	41.6	14.4	36.4	36.5	12.7	3.1	8.6	32.1	56.1	1.2	4.9	32.9	61.0

1. Percentage of plants using sources of information that provided information for new innovation projects, contributed to the completion of existing innovation projects, or provided information for the commercialization of innovation during the three years, 2002 to 2004
2. Contributes to estimates for information and communication technology (ICT) manufacturing industries.

Source: Statistics Canada, Survey of Innovation, 2005.

Two evaluations of the Networks of Centres of Excellence (NCE) program have been conducted (see http://www.nce.gc.ca/pubs_e.htm for reports) and a third has almost been completed. The 2002 evaluation found that it was often possible to link specific impacts to the different processes used within networks. Many of the networks accomplishments were believed to be of high economic and social importance and many examples were provided of potential applications. Roughly a third of researchers, and nearly 60% of partners, believed that their networks had scientific and/or commercial results that were truly groundbreaking in nature. A high proportion of partners (85%) were satisfied or very satisfied with their NCE experience overall. Most of the HQP trained by networks (at least 88% in 2000-2001) found employment after leaving the network (typically after graduation), with roughly half subsequently employed by industry, an effective means of knowledge transfer.

A sample of some highlights from NCE networks supported by NSERC are presented in Figure 51.

Figure 51
Sample of NCE Highlights

Network	Innovation
AllerGen	Canada has broken new ground internationally with the AllerGen Clinical Investigator Collaborative (CIC) – a unique consortium that pools the nation's collective expertise in allergy research to conduct early-stage clinical trials at McMaster, the University of Saskatchewan, University of Alberta, University of British Columbia and Université Laval. The CIC provides a cost-effective way to evaluate how well new molecular compounds treat inflammation in people's breathing passages.
ArcticNet	ArcticNet represents Canada's single largest scientific response to understanding changes in the Arctic. Over 100 ArcticNet researchers and 200 graduate students, post-doctoral fellows, research associates and technicians from 27 Canadian universities and five federal departments collaborate with more than 100 partner organizations from Canada and abroad to study the impacts of climate change in the coastal Canadian Arctic. Their main research platform is the *CCGS Amundsen* research icebreaker, a retrofitted Canadian Coast Guard vessel which began crisscrossing the Canadian Arctic in 2003 to investigate the environmental, social and economic impacts of a warming Arctic.
Auto21	Dr. Mohini Sain and his team have successfully manufactured a lightweight, biodegradable material that is currently being tested for use as interior door panels for cars. For the average North American market, such a panel would have a lifespan of 10 to 15 years. Dr. Sain's team tried fibres from all over the world before settling on wheat, hemp and wood fibre. Then they worked on developing a cost-effective manufacturing process. The savings here were twofold: in the process itself and in the reduced need for petroleum-based products. Dr. Sain and his team isolated individual fibres from agricultural and woody plants, combined them with chemicals and separated the fibres under pressure. The result is a product that looks and feels somewhat like fibreglass, has the strength of carbon fibre and is just as light. If the fibres are combined with natural polymers, the result is totally biodegradable.
Canadian Institute for Photonic Innovations	A new quantum cryptography method, designed at the University of Toronto uses particles of light to share secret encryption keys transmitted over fibre-optic networks. By varying the intensity of laser light particles (photons) used in fibre-optic communications, senders can create decoys that catch eavesdropping attempts.
Canadian Language and Literacy Research Network	Dr. Lily Dyson's work has shown that low-income environments have a negative correlation to children's literacy levels, with poorer children falling behind in Kindergarten and losing ground with each passing year
Canadian Water Network	One technology funded by the network is already showing results at a mine site in Trail BC. Developed by Nature Works Remediation Corp., the system uses inexpensive biodegradable nutrient sources (i.e. manure, spent mushroom compost) to filter arsenic. The process produces less contaminated sludge than chemical systems.
Geomatics for Informed Decisions (GEOIDE)	As part of a geomatics projects, called the Geosalar project, Dr. Patrice Carbonneau developed computer software that automatically translates high resolution aerial photos into maps that provide detailed measurements of the physical environment below, including water depth and even the size of pebbles on the riverbed. The research team led by Dr. Julian Dodson and Dr. Normand Bergeron then used acoustic transmitters to track young salmon as they abandon their freshwater nursery streams and venture out to sea. They also moored instruments to measure current, salinity and temperature. The data were then plugged into a hydrodynamic model, which government agencies and environmental consulting companies will be able to use to predict fish migration patterns and sediment movement. Passive Integrated Transponder (PIT) technology was used to track even younger salmon, called parr. The research team developed a portable antenna to increase the detection range of parr from about 30 centimetres to about 1 metre, and a new 5-metre long portable antenna that can more rapidly scan large stream areas. They also modified the design of commercially available transponders in order to be able to mark fish as small as 8.5 cm. The team is currently burying a wired network of 256 PIT antennas in the substrate of a small river in eastern Quebec. The tools developed in the Geosalar project will help Canada and other countries to manage salmon stocks more effectively through better habitat management.

Figure 51
Sample of NCE Highlights (cont'd)

Network	Innovation
Intelligent Sensing for Innovative Structures (ISIS Canada)	ISIS has won international praise for its expertise in developing fibre reinforced polymer (FRP) and fibre optic sensor (FOS) technologies. FRPs offers many advantages over conventional steel reinforcements in bridges, dams, pipelines, buildings and other structures. The material is six-to-ten times stronger than steel and it is non-corrosive, resulting in a structure that lasts longer and requires less maintenance. The technology is currently used in over 50 structures in Canada, including the Confederation Bridge. Its other breakthrough technology, FOS, is fueling rapid advances in the emerging field of structural health monitoring (SHM). Miniature fibre optic sensors installed in structures during construction can measure – in real-time – the effects of stress, wind, precipitation and even temperature. The research has already led to commercial products, including two readout instruments and a sensor system component. ISIS is now looking at developing a wireless equivalent of the technology.
Mathematics of Information Technology and Complex Systems (MITACS)	Dr. Fahima Nekka and her team are breaking new ground using complex mathematics, supported by in vivo research, to predict the impact of swine feeding behaviour on the animals' exposure to feed-administered antibiotics.
Sustainable Forest Management Network	This network's research is improving forest management practices across Canada, and having a direct impact on public policy. Network findings have helped to support sweeping changes for forest management in Quebec (the Coulombe Commission) and provided significant input to the Ontario Forest Management Guide for Natural Disturbance Pattern Emulation. In Western Canada, Alberta-Pacific Forest Industries Inc. (Al-Pac) is using Network research results to better understand the cumulative effects of human activities in one of Canada's busiest corners of the boreal plain, and helping them to understand the interactions of land use and hydrology in the boreal plain. Several aspects of Louisiana-Pacific Canada's proposed 20-year Forest Management Plan in Manitoba are based on Network research. In Manitoba, Ducks Unlimited is using Network research findings to provide input into changing buffer and riparian guidelines in Manitoba. In New Brunswick, J.D. Irving is continuing to work with Network researchers to determine the range of silviculture intensity that is compatible with the persistence of forest bird populations on the lands it manages.

What follows is a more general presentation of important performance measures related to the productive use of new knowledge. Many NSERC programs have contributed to the successes illustrated below.

INVENTION DISCLOSURES, PATENTS AND LICENCES OBTAINED

Statistics Canada conducts a survey of intellectual property (IP) commercialization in the university sector every one to two years. The latest report can be found at the following site: http://www.statcan.ca/cgi-bin/downpub/listpub.cgi?catno=88F0006XIE2006011 The key results from the first four surveys are highlighted in Figure 52. The survey data are confidential and it is therefore impossible to link the outcomes in the figure below to NSERC funding. However, from NSERC's analysis of patents and publications, it is highly likely that the majority would be attributable to NSERC funding. The sizeable increases seen over the five-year period for most of the commercialization activities presented is a positive result. Other commercialization trends are presented below.

Figure 52
Survey of University Intellectual Property Commercialization

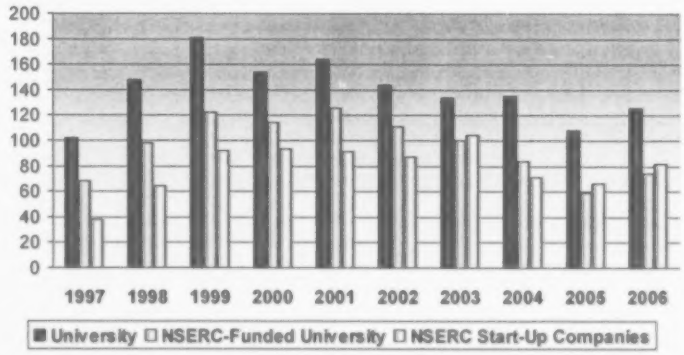
Commercialization Activity	1999	2001	2003	2004
Inventions disclosed	829	1,105	1,133	1,432
Inventions protected	509	682	597	629
New patent applications	616	932	1,252	1,264
Patents issued	325	381	347	397
Total patents held	1,826	2,133	3,047	3,827
New licences	218	320	422	494
Total active licences	1,109	1,338	1,756	2,022
Royalties from licensing ($M)	$18.9	$52.5	$55.5	$51.2
Total spin-off companies	454	680	876	968

Source: Statistics Canada

A patent is issued when an invention is deemed to be new, useful and non-obvious. As shown in Figure 52, Canadian universities are seeking patent protection at an increasing rate. Another measure of this activity is the number of U.S. patents being issued to Canadian universities. As shown in Figure 53, university patent production has increased as compared to the beginning of the decade but has recently fallen back from the highs in the late nineties. An analysis of the nearly 1,400 patents issued to Canadian universies over the past 10 years has found that nearly a 1,000, or 68%, of the patents listed an NSERC-funded professor as one of the inventors. In addition, start-up companies linked to NSERC have been issued 788 U.S. patents over the past decade. As shown in Figre 54, all NSERC-related patents combined account for 5% to 8% of the institutional US. patents assigned to Canadian organizations every year.

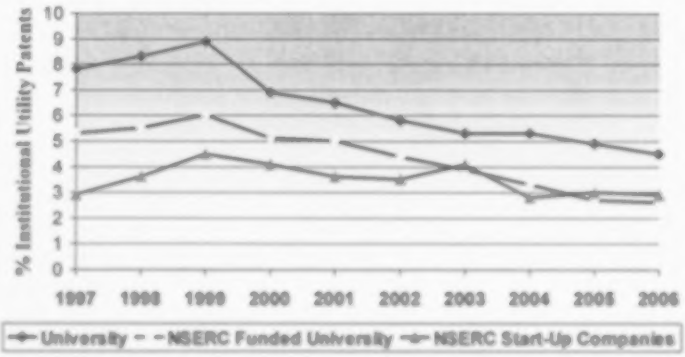
From NSERC's 2007 researcher's survey, patenting activity by the 2,590 respondents was considerable. Over the past five years, 360 Canadian patents and 723 U.S. patents were issued to NSERC-funded professors. This suggest that patent activity is more prevalent than can be seen from just an analysis of patents assigned to universities (i.e., many patents are held/owned by the professor instead of the university).

Figure 53
Number of U.S. Patents Issued to Canadian Universities and NSERC-Funded Start-Up Companies



Source: U.S. Patent Office database. Includes only utility patents.

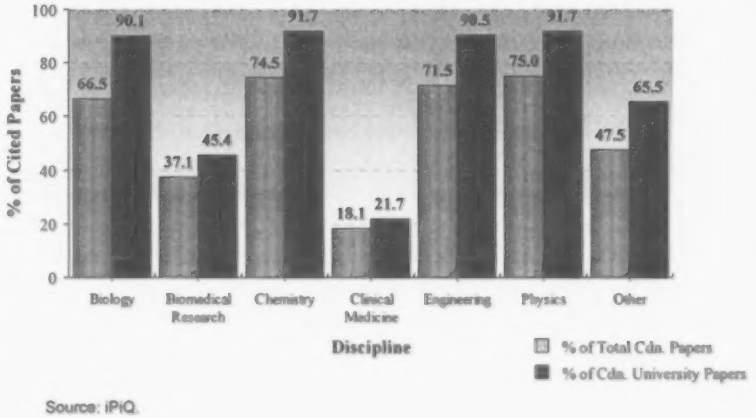
Figure 54
Percentage of Canadian Institutional U.S. Patents Issued to Canadian Universities and NSERC-Funded Start-Up Companies



Source: U.S. Patent Office database. Includes only utility patents.

Another means of measuring research results used by the private and public sector is to study the relationship between patents and scientific literature cited in the patent. It was found that patents issued in the U.S. had cited NSERC-funded science literature to a high degree as compared to all Canadian science literature cited (see Figure 55). Therefore, Canadian companies and foreign firms are likely to frequently cite NSERC-funded science in their patents.

Figure 55
Percentage of Canadian Papers Cited in U.S. Patents that were NSERC-Funded by Discipline and Sector, 1991-2002



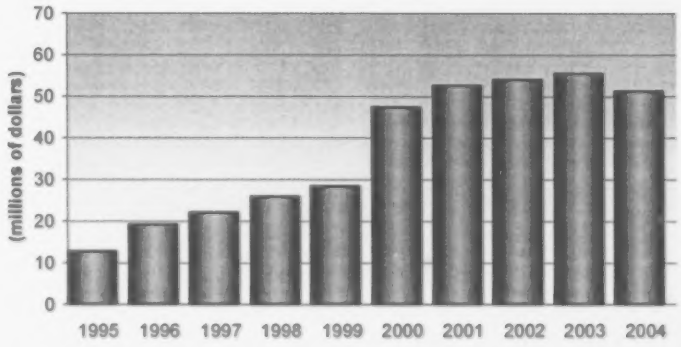
Source: iPIQ.

Another way university research is transferred to industry is through a licence, giving the industrial buyer the right to commercialize the research. Commercial use of the licensed technology results in royalty income to the university and typically the researcher. The amount of licensing royalty revenues is another measure of the value of university research. Figure 56 presents an estimate of licensing revenues for Canadian universities. Most of these revenues can at least be partially attributed to funding from NSERC and CIHR. The trend in revenue growth has generally been positive over the decade and it should continue to grow as universities strive to secure additional revenues. Examples of licences based on NSERC-funded research are presented in Figure 57. From Statistics Canada's *Survey of Innovation*, Figure 58 presents the frequency with which "innovative firms" licensed technologies from universities or government sources from 2002 to 2004. The pharmaceutical, primary metal, chemical, and plastics and rubber industries were significant licensees of university technologies.

From a survey conducted by the Association of University Technology Managers (AUTM), a comparison of 30 Canadian universities (including universities such as

Queen's, McGill, Alberta, Toronto, Waterloo, Dalhousie, Calgary, UBC, etc.) to 158 U.S. universities on several commercialization activities is shown in Figure 59. These activities were normalized for sponsored research expenditures. Ratios below 1.0 indicate that the Canadian universities in the sample are engaged in the activity less frequently than their U.S. counterparts. Canadian universities perform significantly below U.S. universities on licence income received and patents issued, as well as U.S. institutions on start-up company formation and inventions disclosures, and perform much better than the U.S. institutions on licences and options executed.

Figure 56
Canadian University Licensing Revenue
(millions of dollars)



Source: NSERC estimate based on Association of University Technology Managers data and Statistics Canada data for 2001, 2003 and 2004.

Figure 57
NSERC-Funded Innovations That Were Licensed

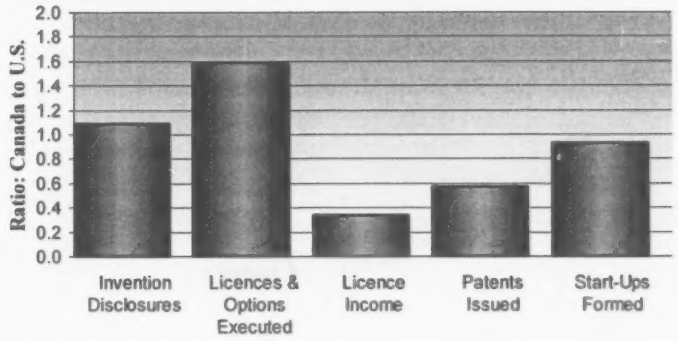
What	Where	Who	Licensed to
Aquamat, a multi-layered capillary mat to capture water and distribute it evenly to plants in nurseries.	Université Laval	Dr. Jean Caron	Soleno Textiles (Laval, QC)
OsteoScaf™, a synthetic scaffold that provides a framework for growing tissue to speed the healing of severe bone breaks.	University of Toronto	Dr. Moillet Shoichet	Tissue Regeneration Therapeutics (Toronto, ON)
Complex mathematical formulas allow machines to recognize objects. Sony uses the computer vision package in its AIBO dog robots.	University of British Columbia	Dr. David Lowe	Evolution Robotics (Pasadena, CA)
Autostitch™, the first 2-D image-stitcher which stitches pictures together to form a composite image that can be view in a panorama of upto 360°.	University of British Columbia	Dr. David Lowe	3Cim (Santa Clara, CA) Serif Europe (Nottingham, UK) Industrial Light and Magic (San Rafael, CA)
An inhaler that contains thousands of nanoparticles todeliver lung cancer medication diredly to the lungs.	University of Alberta	Dr. Warren Finlay	LAB International (St-Laurent, QC)
A new design for power amplification of cellular base stations to improve efficiency and power consumption.	Simon Fraser University	Dr. Shawn Stapleton	PulseWave RF (Austin, TX)
Sonar technology that provides high-resolution underwater acoustic mapping and imaging in hree dimensions.	Simon Fraser University	Dr. John Bird	Teledyne Benthos (North Falmouth, MA)
Viscofiber®, Cevena's brand name for beta-glucan, is a fiber found in the cell walls of oat andbarley.	University of Alberta	Dr. Thava Vasanthan Dr. Feral Temelli	Cevena Bioproducts (Edmonton, AB)
MAPLE, a software program that tracks radar-based precipatation patterns to forecast future precipatation for up to six hours.	McGill University	Dr. Isztar Zawadzki Dr. Charles Lin	Weather Decision Technologies (Norman, OK)
Technology produces single-walled carbon nanotubes (C-SWNT), based on a plasma process that is more efficient, less costly andnon-polluting.	Institut national de la recherche scientifique	Dr. Barry Stansfield	Raymor Industries (Boisbriand, QC)
mBOT is a newadaptive learning music recommendation system that automatically poposes songs based on past knowledgeto play them through the Internet.	McGill University Université de Montréal	Dr. Daniel Levitin Dr. Yoshua Bengio Dr. Douglas Eck	Double V3 (Montreal, QC)
Algorithms bring panchromatic and multispectral imagery together to create a high-resolutin colour image.	University of New Brunswick	Dr. Yun Zhang	PCI Geomatics (Richmond Hill, ON)

Figure 58
Percentage of plants that acquired licenses from other firms or organizations during the three years, 2002 to 2004

Canada, Innovative Plants	A Canadian university	A Canadian federal government lab	A provincial or territorial government lab
Logging	x	x	x
Manufacturing	2.7	4.3	2.5
Food manufacturing and beverage and tobacco product manufacturing	0.0	20.7	21.4
Textile mills and textile product mills	5.1	5.1	0.0
Clothing manufacturing and leather and allied product manufacturing	0.0	0.0	0.0
Wood product manufacturing	0.0	8.9	0.0
Sawmills and wood preservation	0.0	0.0	0.0
Veneer, plywood and engineered wood product manufacturing	0.0	0.0	0.0
Other wood product manufacturing	0.0	F	0.0
Paper manufacturing	0.0	0.0	0.0
Pulp, paper and paperboard mills	0.0	0.0	0.0
Converted paper product manufacturing	0.0	0.0	0.0
Printing and related support activities	3.7	1.2	0.0
Petroleum and coal products manufacturing	0.0	0.0	0.0
Chemical manufacturing	12.2	0.0	0.0
Chemical manufacturing (excluding pharmaceutical and medicine manufacturing)	8.0	0.0	0.0
Pharmaceutical and medicine manufacturing	21.8	0.0	0.0
Plastics and rubber products manufacturing	10.4	3.0	1.5
Non-metallic mineral product manufacturing	0.0	0.0	0.0
Primary metal manufacturing	15.6	3.3	0.0
Fabricated metal manufacturing	0.5	0.0	0.0
Machinery manufacturing	0.9	0.8	0.0
Machinery manufacturing (excluding commercial and service industry machinery manufacturing)	0.0	0.9	0.0
Commercial and service industry machinery manufacturing[1]	8.9	0.0	0.0
Computer and electronic product manufacturing	4.9	8.1	0.0
Computer and peripheral equipment manufacturing[1]	0.0	5.3	0.0
Communications equipment manufacturing	3.2	0.0	0.0
Telephone apparatus manufacturing[1]	x	x	x
Radio and television broadcasting and wireless communications equipment manufacturing[1]	6.1	0.0	0.0
Other communications equipment manufacturing	0.0	0.0	0.0
Audio and video equipment manufacturing[1]	x	x	x
Communications equipment manufacturing and audio and video equipment manufacturing	8.7	0.0	0.0
Semiconductor and other electronic component manufacturing[1]	0.0	4.2	0.0
Navigational, measuring, medical and control instruments manufacturing	6.9	17.7	0.0
Navigational and guidance instruments manufacturing[1]	5.1	15.6	0.0
Measuring, medical and controlling devices manufacturing[1]	7.9	18.9	0.0
Manufacturing and reproducing magnetic and optical media	x	x	x
Navigational, measuring, medical and control instruments manufacturing and manufacturing and reproducing magnetic and optical media	6.5	16.7	0.0
Electrical equipment, appliance and component manufacturing	2.7	0.0	0.0
Electrical equipment, appliance and component manufacturing (excluding communication and energy wire and cable manufacturing)	0.0	0.0	0.0
Communication and energy wire and cable manufacturing[1]	12.4	0.0	0.0
Transportation equipment manufacturing	0.0	2.4	2.4
Transportation equipment manufacturing (excluding aerospace product and parts manufacturing)	0.0	0.0	0.0
Aerospace product and parts manufacturing	0.0	11.4	11.4
Furniture and related product manufacturing	0.0	0.0	0.0
Miscellaneous manufacturing	0.0	0.0	0.0
Information and communication technology (ICT) manufacturing industries	6.0	7.8	0.0

1. Contributes to estimates for information and communication technology (ICT) manufacturing industries.
Source: Statistics Canada, Survey of Innovation, 2005.

Figure 59
Comparison of Canadian Universities with U.S. Universities on Selected Commercialization Measures, 2005



Source: NSERC estimates based on AUTM data for 30 Canadian universities vs. 158 U.S. universities.

START-UP COMPANIES ESTABLISHED

The creation of a company remains one of NSERC's more tangible outcomes of university-funded research. Every two years, NSERC engages in a detailed study to uncover firms that were created based on university research. The profiles of these companies are published in the report *Research Means Business*, available on the web at: http://www.nserc.gc.ca/about/corp_pub_e.asp. (Note: The next edition of the report will be available in the Fall of 2007.) The start-up companies highlighted in the latest report have all been founded on results of research funded partially by NSERC. The 141 start-up companies featured (see Figure 60 on the next page) are currently in the business of producing goods and services for Canadian and international markets. Combined, these companies employ nearly 13,000 Canadians and generate more than $3.5 billion in annual sales/revenue. Creating innovative goods and services using the latest technologies, these firms make an important contribution to Canada's economy. The potential for future growth of many of these advanced technology companies, which may be tomorrow's multi-nationals, is high. They range in size from new start-ups with only a few employees to well-established firms with hundreds of workers.

As of June 2007, 28 of the 141 start-up companies examined are/were publicly-traded firms. Although the gyrations of the markets have been significant in recent years, the market capitalization of these 28 publicly-traded firms on June 20, 2007 was an impressive $13.8 billion (see Figure 61). The overall market capitalization of these firms is once again approaching records highs not seen since the dot-com bubble. In addition to the direct economic benefits of contributing to Canadian GDP and employment, longer-term potential benefits of these start-up companies also exist. One already mentioned is the nearly 800 U.S. patents issued to the start-up companies over the past 10 years. Another secondary benefit has been the growth of major R&D firms in the country. In 2006, six of the top 100 Canadian R&D companies (as ranked by *Research Infosource*, 2006) were NSERC-related start-up companies with a combined R&D expenditure of $296M (see Figure 62). Many other university start-up companies not linked to NSERC are also part of the top 100 R&D companies. These results are important as Canada strives to increase R&D spending by Canadian firms.

Figure 60: Companies Linked to NSERC-Funded Research, 1954 to 2004
(Number of employees in Canada in 2004)

British Columbia

- MacDonald Dettwiler and Associates (1400)
- E-One Moli Energy (Canada) (430)
- QLT (384)
- Westport Innovations (140)
- TIR Systems (122)
- Freshxtend Technologies (50)
- NxtPhase (50)
- MIGENIX (37)
- Forbes Medi-Tech (28)
- Albacore Research (20)
- Phero Tech (20)
- JGKB Photonics (15)
- PhoeniX Technologies (15)
- Brightside Technologies (14)
- Actenum (12)
- Membrane Reactor Technologies (12)
- Wildlife Genetics International (9)
- Barrodale Computing Services (8)
- GeneMax Pharmaceuticals (8)
- MycoLogic (8)
- SynGene Biotek (8)
- Process Simulations (7)
- Quantum Technology (6)
- Syscor Research & Development (6)
- Advanced Integrated MicroSystems (Canada) (5)
- DBMiner Technology (5)
- Credo Interactive (4)
- Prescient NeuroPharma (4)
- Aurora Instruments (Confidential)

Alberta

- Stantec (2548)
- Raylo Chemicals (220)
- Wi-LAN (160)
- Biomira (106)
- Hycal Energy Research Laboratories (60)
- Harding Instrument Company (50)
- Dynastream Innovations (40)
- SemBioSys Genetics (40)
- ITRES Research (26)
- Cell-Loc Location Technologies (12)
- Zoomage (10)
- MBEC BioProducts (9)
- Chenomx (8)
- Smart Camera Technologies (8)
- Random Knowledge (7)
- AB BioPharma (5)
- Boreal Laser (5)
- CanBiocin (5)
- AgriGenomics (Confidential)

Saskatchewan

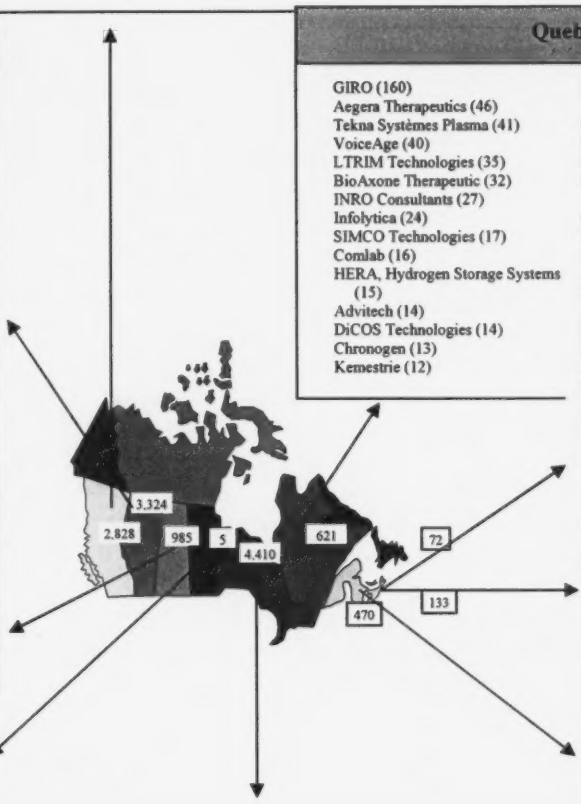
- VCom® (466)
- SED Systems-a division of Calian (225)
- International Road Dynamics (150)
- DEL-AIR Systems (100)
- Accutrak Systems (15)
- VEMAX Management (15)
- Droycon Bioconcepts (9)
- Western Ag Innovations (5)

Manitoba

- Quantic EMC (Confidential)

Quebec

- GIRO (160)
- Aegera Therapeutics (46)
- Tekna Systèmes Plasma (41)
- VoiceAge (40)
- LTRIM Technologies (35)
- BioAxone Therapeutic (32)
- INRO Consultants (27)
- Infolytica (24)
- SIMCO Technologies (17)
- Comlab (16)
- HERA, Hydrogen Storage Systems (15)
- Advitech (14)
- DiCOS Technologies (14)
- Chronogen (13)
- Kemestrie (12)
- Newmerical Technologies International (12)
- Quantiscript (12)
- Microbridge Technologies (10)
- Nanox (10)
- Service d'Expertise en Matériaux (S.E.M.) (10)
- GBBC Medica (9)
- Magistral Biotech (9)
- ENERKEM Technologies (8)
- Axiocom (6)
- MXT (6)
- AXIS Photonique (5)
- E.M Optimisation (5)
- Plasmionique (5)
- BytePress (4)
- SiXtron Advanced Materials (4)



Newfoundland

- AQUA Bounty Canada (30)
- Guigné International (25)
- A/F Protein Canada (10)
- Northern Radar (7)

Nova Scotia

- Ocean Nutrition Canada (256)
- Focal Technologies (85)
- AMIRIX Systems (70)
- Satlantic (40)
- MathResources (12)
- Thermo Dynamics (7)

New Brunswick

- CARIS (125)
- Interactive Visualization Systems (8)

Ontario

- DALSA (878)
- ZENON Environmental (850)
- MDS Sciex (500)
- Open Text (400)
- Platform Computing (275)
- Optech (210)
- iAnywhere Solutions (195)
- Virtek Vision International (166)
- Sybase Canada (115)
- Powerlasers (110)
- Certicom (105)
- Novator Systems (65)
- SatCon Power Systems Canada (65)
- Millenium Biologix (43)
- Pressure Pipe Inspection Company (40)
- Decision Academic (33)
- Hydromantis (33)
- Performance Plants (33)
- Ensyn Technologies (30)
- Dynacon (25)
- TurboSonic (25)
- Engineering Seismology Group Canada (22)
- BIOREM Technologies (21)
- Engineering Services (17)
- IGNIS Innovation (15)
- Techné Knowledge Systems (15)
- Axela Biosensors (14)
- Biomedical Photometrics (12)
- Vivosonic (12)
- BIOX (9)
- CVD Diamond (8)
- GeoTango International (8)
- Datec Coating (7)
- Qubit Systems (7)
- Sigma Analysis and Management (7)
- EnviroMetal Technologies (6)
- Interface Biologics (6)
- Elstat (5)
- Simulent (5)
- matREGEN (4)
- iGO Technologies (Confidential)
- Maplesoft (Confidential)

Figure 61
Market Capitalization of Start-up Companies

Company	Market Capitalization							
	June 20, 2007	July 21, 2006	June 28, 2005	June 14, 2004	July 28, 2003	July 29, 2002	August 15, 2001	June 12, 2000
Shire BioChem Pharma	$3.406 M[1]	$3.406 M[1]	$3.406 M[1]	$3.406 M[1]	$3.406 M[1]	$3.406 M[1]	$3,406 M	$3,607 M
MDS Sciex	$2,646 M	$2,978 M	$- M	$- M	$- M	$- M	$- M	$- M
MacDonald Dettwiler	$1,892 M	$1,617 M	$1,229 M	$1,038 M	$903 M	$727 M	$836 M	$- M
Stantec	$1,669 M	$434 M	$563 M	$472 M	$341 M	$292 M	$208 M	$95 M
Open Text	$1,171 M	$722 M	$858 M	$1,921 M	$728 M	$544 M	$638 M	$845 M
ZENON Environmental	$760 M[1]	$760 M[1]	$789 M	$633 M	$427 M	$429 M	$319 M	$153 M
QLT	$615 M	$654 M	$1,176 M	$1,668 M	$1,636 M	$1,177 M	$2,249 M	$6,152 M
Wi-LAN	$417 M	$62 M	$35 M	$110 M	$94 M	$54 M	$85 M	$852 M
DALSA	$227 M	$261 M	$298 M	$392 M	$245 M	$123 M	$71 M	$49 M
Westport Innovations	$207 M	$70 M	$103 M	$125 M	$110 M	$200 M	$303 M	$359 M
Certicom	$173 M	$229 M	$191 M	$134 M	$42 M	$33 M	$125 M	$896 M
Biomira	$138 M	$96 M	$163 M	$139 M	$100 M	$185 M	$460 M	$674 M
TIR Systems	$75 M[1]	$26 M	$42 M	$103 M	$25 M	$10 M	$6 M	$6 M
AD OPT Technologies	$73 M[1]	$73 M[1]	$73 M[1]	$53 M	$34 M	$31 M	$36 M	$62 M
Migenix	$64 M	$32 M	$25 M	$58 M	$22 M	$31 M	$- M	$- M
SatCon Power Systems	$51 M	$106 M	$59 M	$92 M	$17 M	$- M	$- M	$- M
SemBioSys Genetics	$45 M	$51 M	$57 M	$- M	$- M	$- M	$- M	$- M
Forbes Medi-Tech	$31 M	$78 M	$71 M	$94 M	$52 M	$14 M	$73 M	$155 M
Cell-Loc Location	$30 M	$14 M	$6 M	$9 M	$15 M	$47 M	$27 M	$- M
International Road Dynamics	$29 M	$18 M	$16 M	$- M	$- M	$- M	$- M	$- M
Virtek Vision International	$25 M	$35 M	$21 M	$33 M	$17 M	$24 M	$60 M	$53 M
TurboSonic	$18 M	$20 M	$8 M	$4 M	$6 M	$3 M	$- M	$- M
BIOREM Technologies	$16 M	$21 M	$2 M	$- M	$- M	$- M	$- M	$- M
Prescient NeuroPharma	$15 M	$1 M	$1 M	$1 M	$4 M	$7 M	$- M	$- M
Advitech	$6 M	$4 M	$1 M	$- M	$- M	$- M	$- M	$- M
FreshXtend Technologies	$5 M	$8 M	$4 M	$- M	$- M	$- M	$- M	$- M
GeneMax Pharmaceuticals	$2 M	$2 M	$2 M	$13 M	$33 M	$21 M	$- M	$- M
Newmerical Technologies	$2 M	$2 M	$2 M	$9 M	$4 M	$- M	$- M	$- M
Innova LifeSciences	$- M	$- M	$- M	$38 M	$40 M	$35 M	$18 M	$21 M
Lumenon Lightwave Technologies	$- M	$- M	$- M	$- M	$2 M	$6 M	$- M	$- M
Kipp & Zonen	$- M	$- M	$- M	$- M	$2 M	$2 M	$- M	$- M
Magistral Biotech	$- M	$-M	$5 M	$- M	$- M	$- M	$- M	$- M
Millenium Biologix	$- M	$10 M	$48 M	$- M	$- M	$- M	$- M	$- M
Nexia Biotechnologies	$- M	$- M	$4 M	$40 M	$20 M	$66 M	$158 M	$- M
Polyphalt	$- M	$- M	$- M	$- M	$2 M	$9 M	$13 M	$- M
Total	**$13,808 M**	**$11,790 M**	**$9,258 M**	**$10,585 M**	**$8,327 M**	**$7,476 M**	**$9,091 M**	**$14,470 M**

1. Market capitalization at time of buyout.
Source: Globe and Mail

Figure 62
R&D Spending of Top Start-Up Companies Linked to NSERC

NSERC Funded Start-Up Company	Rank	R&D Expenditure (millions of dollars)
QLT Inc.	30	$90.4
Open Text Corporation	33	$78.9
MacDonald Dettwiler & Associates	48	$49.0
DALSA Corporation	63	$36.8
Westport Innovations	78	$24.4
Biomira	92	$16.9

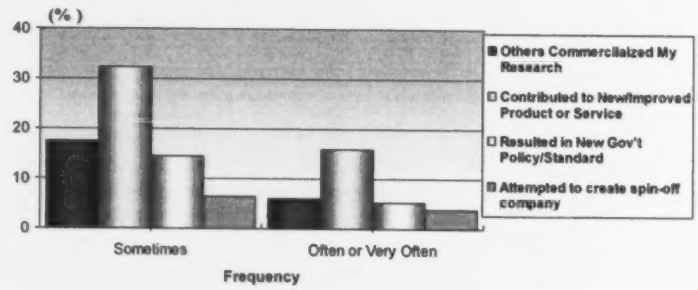
Source: Research Infosource, Canada's Top 100 Corporate R&D Spenders List 2006

NEW AND IMPROVED PRODUCTS AND PROCESSES INTRODUCED TO MARKET

NSERC-funded researchers have created or developed many new products and processes, the value of which is difficult to estimate. Respondents to NSERC's 2007 researcher's survey, previously mentioned, indicated significant involvement in the development of new goods or services (see Figure 63).

Also as part of a past evaluation of NSERC's largest program, the Discovery Grants program, over 20% of the 3,032 respondents who held a grant indicated a major contribution to the development of new or improved products or processes. By way of example, Figures 64 to 67 list a sample of some of the new products or processes developed by NSERC-funded professors in the environmental, information technology, health and energy sectors, respectively.

Figure 63
NSERC-Funded Professors' Knowledge Transfer Activities Over Past 5 Years



Source: NSERC researcher survey 2007.

Figure 64

Environment Innovations Funded by NSERC

What	Where	Who	Why
Biodegradable packaging for cosmetics	University of Toronto	Dr. Mohini Sain	Working with Cargo cosmetics, Dr. Sain and his team developed a lipstick tube made entirely from biodegradable plastic.
Biofilter System	University of Waterloo & BIOREM	Dr. Owen Ward	Use natural microbial activity to clean up toxic sites. Bioremediation is a cost efficient biological process that uses naturally occurring microorganisms to degrade and reduce toxic materials and accelerate the treatment of soils contaminated with toxic organic chemicals.
Biological weed control	McGill University	Dr. Alan Watson	The fungus, *Sclerotina minor*, used to control of dandelions, without harming the surrounding environment, including birds.
CO_2 to kill pests	University of Manitoba	Dr. Digvir Jayas	Dry ice to kill insects in grain stores. The product costs the same as chemical pesticides, but is safer to administer and is environmentally friendly.
HYFRAN	Institut national de la recherche scientifique	Dr. Bernard Bobée	HYFRAN software is used by staff at Hydro Quebec to improve the management of surface waters on their land.
Non-Insecticidal Pest Management	Simon Fraser University & Phero Tech Inc.	Dr. John Borden	Use semiochemicals to lure and trap pests in order to monitor pest population.
Organic Compounds	University of Waterloo & EnviroMetal Technologies Inc.	Dr. Robert Gillham	Technology is able to destroy harmful organic compounds by using granular ion. This can be used in order to solve a wide range of environmental problems including those involving the release of chlorinated organic chemicals.
Polluted soil remediation technology	University of Saskatchewan	Dr. Gordon Hill	Has developed a prototype bead bioreactor in the lab, successfully removing creosotes and other pollutants from contaminated soil.
Reduction of sludge	Carleton University	Dr. Banu Örmeci	Developed early stage technology to remove the water from the sludge effectively using innovative dewatering techniques.
(RTP) Rapid Thermal Processing	University of Western Ontario & Ensyn Technologies	Dr. Maurice Bergougnou Dr. Robert Graham	Disposing of large amounts of solid wastes in an environmentally friendly fashion can be done using RTP technology, which transforms forest residues, municipal wood waste and agricultural wastes into valuable liquid fuels and chemicals.
Septic tank failure prevention device	Dalhousie University	Dr. Mysore Satish	The "flow balancer" eliminates the threat of saturation from a septic tank by forcing the effluent into two equal streams which distributes it evenly across the disposal bed.
Wastewater Treatment	University of Ottawa & Hydromantis Inc.	Dr. Gilles Patry	Powerful simulation software enables wastewater treatment plant operators to save money by managing their facilities more efficiently, from the conceptual stage to full-scale operations.

Figure 65

Information Technologies Innovations Funded by NSERC

What	*Where*	*Who*	*Why*
A better chip	University of Toronto	Dr. Ted Sargent	'Wet chemistry' used to create a semiconductor in a test tube.
Faster cellphone functions	Concordia University	Dr. Mourad Debbabi	The dynamic selective compiler program improves cellphone applications by 400%.
Computer model to assess ecosystem	University of British Columbia	Dr. Younes Alila	Computer model capable of measuring 6,000 variables in a forest system. Helped researchers assess the effects of the mountain pine-beetle infestation and subsequent logging in the Fraser River watershed.
Computer that writes articles	Simon Fraser University	Dr. Anoop Sarkar	SQuASH (SFU question answering summary handler) is a computer program that scans newspapers, academic abstracts and other documents and, with a set of questions from the user, creates a short summary.
Computer simulation helps transportation	University of Toronto	Dr. Eric Miller	Software simulates the lives of 100,000 households – basically a whole city – to help them to design transportation systems.
Eliminating confusing drug names	University of Alberta	Dr. Greg Kondrak	Developed two computer programs used by the U.S. Food and Drug Administration to create drug names that don't sound or look the same. Confusion over the names of drugs has led to over 160,000 deaths in the United States.
New cryptography technique	University of Toronto	Dr. Hoi-Kwong Lo	Developed a new technique that uses a photonic decoy to encrypt data over fibre optic cable.
Optical and digital recognition technique	Université Laval	Dr. Henri Arsenault	Optical and digital techniques recognize patterns in objects that change position, orientation or distance from where they are being observed making it easier to identify the faces of people moving around in a crowd for security purposes.
Software to manage winter road maintenace operations	Université de Montréal	Dr. Michel Gendreau Dr. Jean-Yves Potvin	Developped software that takes into account 21 factors to help municipalities manage snow clearning and road salt applications.
Tracking terrorists' communications	Queen's University	Dr. David Skillicorn	A set of measures to detect messages with words that have been deliberately replaced to conceal their real content.
TransType	Université de Montréal	Dr. Guy Lapalme	Series of language tools designed specifically for translators. The "TransType" tries to anticipate in real time what a translator will type next. The software makes suggestions which can be incorporated directly into a translated text or simply used as a source of ideas.
Wireless network monitors potash mines	University of Saskatchewan	Dr. Brian Daku Warren Hawkins	Developed a prototype wireless network to monitor a potash mine's roof and floor.

Figure 66

Health Innovations Funded by NSERC

What	Where	Who	Why
Alternative to artery-clogging trans fats	University of Guelph	Dr. Alejandro Marangoni	A new way to package oils and change them into a solid fat-like gel. The gel provides the same structural and functional benefits as trans and saturated fats, but it releases fats to the body in a more controlled way.
Armrest reduces repetitive strain injuries	University of Guelph	Dr. Michele Oliver	New armrest reduces muscle activities in the neck, which helps prevent repetitive strain injuries. Originally designed for machinery operations, it can be used on any chair.
Diagnosing asthma in children	Dalhousie University	Dr. Geoffrey Maksym	A more sensitive and reliable diagnostic technique that measures spasms in the smooth muscle lining a patient's airways.
First instrument to travel inside blood vessels	École Polytechnique de Montréal	Dr. Sylvain Martel	The first prototype of a micro-instrument capable of travelling inside an animal's carotid artery. The device travels a set trajectory previously established by software.
Mini vehicles to treat cancer	Université de Sherbrooke	Dr. Yue Zhao	A process to encapsulate medication in a microscopic molecule, called nanovehicles, which are dispatched directly to the area targeted for chemotherapy.
Preventing 'fertility twins'	McGill University	Dr. David Burns	In vitro fertilisation, IVF, can help produce twins or triplets because doctors implant more than one embryo in order to improve the odds that one baby will survive. Dr. Burns has developed a test to help screen for the best embryo allowing doctors to implant only one candidate, thereby avoiding the complications of multiple births.
Software program to detect knee disorders	University of Western Ontario Ryerson University	Dr. Karthikeyan Umapathy Dr. Sridhar Krishnan	A computer program that can detect knee disorders like arthritis with a high degree of accuracy.
Tactile Sensors for Surgical Tools	Concordia University	Dr. Javad Dargahi	Sensors that can be attached to surgical tools to capture images of internal organs to provide minimally invasive surgery.
Vital Signs Monitor	University of British Columbia	Dr. Guy Dumont Dr. Mark Ansermino	A new device that alerts doctors to changes in the vital signs of their patients by providing a vibration, pressure, heat or pulses of air instead of noise which already proliferates healthcare settings.
Virtual scoliosis surgical software	École Polytechnique de Montréal	Dr. Carl-Éric Aubin	Pre-operative surgical simulation tool allows surgeons to test the effects of scoliosis operations before they make an incision and plan which implants to use in order to obtain optimal correction.

Figure 67

Energy Innovations Funded by NSERC

What	*Where*	*Who*	*Why*
Biodiesel fuels	University of Toronto Biox Corporation	Dr. David Boocock	By using any feedstock, including vegetable oils, agricultural seed oils, animal fats/greases and recycled cooking oils can turn them into biodiesel fuel at a cost that is competitive with petroleum diesel.
Environmentally-friendly way to separate oil from dirt	Queen's University	Dr. Philip Jessop	A chemical that binds or separates water and oil on command. Can be used to remove oil from the ground and separate it from clay while minimizing costs and impacts on the environment.
Ethanol	University of British Columbia	Dr. Jack Saddler	Use of microorganisms and enzymes to convert wood and forestry waste into ethanol fuel.
Gas sensors for the mining industry	McGill University	Dr. James Finch	Gas sensor instruments have been adopted by mining companies around the world.
Heat recovery ventilators	University of Saskatchewan DEL-AIR Systems Ltd.	Dr. Robert Besant	System brings fresh air into the barn and recovers heat that would otherwise need to be supplemented.
Hydride materials	McGill University Hera, Hydrogen Storage Systems Inc.	Dr. John Ström-Olsen	Hydride materials can be absorbed and released as hydrogen which have distinctive heat and pressure characteristics. This means that they are well suited for solid state hydrogen storage, hydrogen compression, heating and cooling, and nickel-hydrogen batteries.
Natural lighting in buildings	University of British Columbia	Dr. Lorne Whitehead	A system by which the sun can be bounced 15 metres or more into a building without losing brightness.
Solar power heats greenhouses year-round	University of Manitoba	Dr. Qiang Zhang	Method uses a heat-absorbing cement wall and swaths of clear plastic "pillows" filled with argon gas to capture and release the sun's energy and keep plants warm through cold winter nights.
Solid state hydrogen storage	University of New Brunswick	Dr. Sean McGrady	A more efficient way to store hydrogen in a solid state. The discovery moves things one step closer to making hydrogen fuel a cost-effective alternative to traditional fuel sources.
Westport High Pressure Direct (HDT) injection technology	University of British Columbia Westport Innovations Inc.	Dr. Philip Hill	System converts diesel engines to natural gas. HPD injection technology maintains the efficiency and high performance of a diesel engine, while cutting particulate and nitrogen oxide emissions in half. The system is retrofitted to existing engines, so the changeover will cause little disruption.
Capturing hydrogen fuel cells	University of Windsor	Dr. Douglas Stephan	Discovered a new way to capture and release hydrogen. This may eventually prove useful in the development of lightweight fuel cells to power vehicles.

In addition to new process and product development, NSERC funding can also have an impact on public policy. Figure 63 also indicates the frequency with which NSERC-funded professors have contributed to new government policies or standards. In addition, as part of the Discovery Grants program evaluation, 12.7% of the 3,032 respondents who held a grant indicated a major contribution to changes in policies or standards.

2.3.2 SUPPORT COMMERCIALIZATION

An overview of the "support commercialization" program activity is presented below:

Description:	This program activity supports innovation and promotes the transfer of knowledge and technology to Canadian companies. It directly addresses NSERC's priority of Realizing the Benefits by funding the pre-commercial development of promising innovations, supporting technology transfer activities at Canadian universities, and supporting the training of people with the scientific and business skills sets required to exploit new discoveries for economic benefit.
Expected Results:	Supported institutions managing their intellectual property (IP) assets for economic and social benefits, and the number of commercialization specialists trained and their subsequent employment and income levels. Number of successful validations of technical and economic feasibility of an invention or discovery, the ability of small and medium-sized companies to acquire new technical capabilities and/or take a new product to market, and the number of HQP trained through such projects.
Planned Spending:	$16.5M
Actual Spending:	$12.0M
Planned Human Resources (FTE):	6
Actual Human Resources (FTE):	11
Number of clients supported by NSERC:	
Universities (IPM)	18
Professors	105
Undergraduate Students	24
Master's/Doctoral Students	49
Postdoctoral Fellows	20

The key programs under this program activity are:

- **Intellectual Property Mobilization (IPM) Program ($3.3M)**: Developed by NSERC in 1995, this program is now funded by NSERC, SSHRC and CIHR. The objective of this program is to accelerate the transfer of knowledge and technology residing in Canadian universities and hospitals for the benefit of Canada. The IPM program provides funding in partnership with universities and hospitals to support activities related to managing and transferring intellectual property resulting from publicly funded research performed at universities.

The Networked Training Initiative is a critical component of the IPM program. This successful program provides seed funding for the development of technology transfer and commercialization specialists through commercialization internship programs.

- **Idea to Innovation (I2I) Program ($6.2M)**: I2I accelerates the pre-competitive development of promising technologies and promotes its transfer to Canadian companies. The program supports R&D projects with recognized technology transfer potential by providing crucial assistance to university researchers in the early stages of technology validation and market connection.

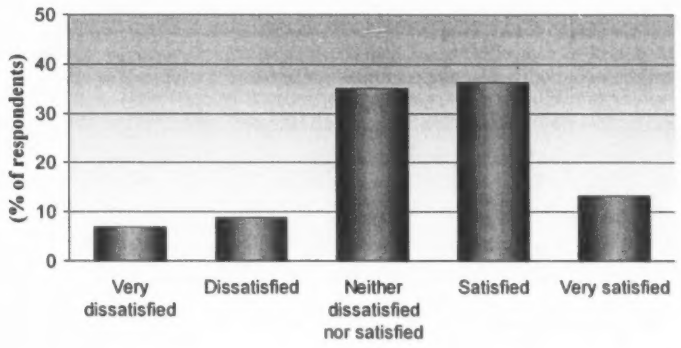
  The I2I program helps increase the technology transfer of university discoveries by providing a flexible, two-phase funding arrangement. Phase I awards are made for a proof-of-concept stage where NSERC will support 100% of the research; while Phase II grants focus on technology enhancement and research costs in this phase are also supported by a private-sector partner.

- **College and Community Innovation Program ($1.2M)**: This program increases the capacity of colleges to support innovation at the community or regional level. The program design and funding are intended to stimulate new partnerships and increased entrepreneurship, and to assist the colleges to take risks and be nimble in developing new ways of working with local businesses and industries to spur innovation and economic growth.

Funding for the administration of the above programs rounds out the spending under this program activity.

As presented in Figure 52, university technology transfer offices are handling an ever increasing load of intellectual property management. NSERC was a pioneer in funding university technology transfer offices when it started its Intellectual Property Mobilization program in 1995-96. In 2006-07, funding for the program was $3.2 million compared to technology transfer office expenditures of $36.9 million (2004). Combined with additional funding from CIHR and SSHRC, the granting councils are important contributors to technology transfer operations on university campuses and in hospitals. In addition, the launch of the Indirect Cost program has benefited technology transfer offices. An evaluation is currently underway of the IPM program and performance measures will be reported in the next DPR. From the 2007 NSERC researcher's survey, Figure 68 presents the level of satisfaction with the intellectual property policy of the institution. Overall, the level of satisfaction is fairly high, with less than 16% of respondents (1,927) being dissatisfied. From the same survey respondents also identified the types of services provided to them by their technology transfer offices (see Figure 69). Almost one-third of respondents used the services of their technology transfer offices in the past 5 years. The most frequently used service was preparing contracts, patent assessment and applications, and negotiating licences.

Figure 68
Level of Satisfaction with University's Intellectual Property Policy



Source: NSERC researcher's survey 2007

Figure 69
Technology Transfer Office Services Used

Dissemination Activity to Private Firms by NSERC-funded Professors	Never or rarely (%)	Sometimes (%)	Often or very often (%)
Assessing the patentability of inventions	47.7	35.5	16.8
Applying for patents	59.0	25.8	15.2
Negotiating or arranging licenses	61.7	23.5	14.8
Providing incubator facilities to companies	88.8	8.1	3.1
Preparing contracts needed to initiate research projects and those linked to the exploitation of a new technology (new discovery)	43.1	32.8	24.1
Publicising technology in order to raise general awareness to business media, technology transfer networks and to selected industrial sectors	74.6	16.8	8.6
Marketing technology by specifically making face to face contacts with potential customers (rather than simply promotional activities)	80.4	13.3	6.3
Attracting investors especially when formation of a spin-off is contemplated	85.9	10.8	3.4
Producing business plans and exploitation strategies	87.9	8.9	3.2
Identifying and assessing market opportunities that are most appropriate for a technology (new discovery)	77.8	15.6	6.7

Source: NSERC Researcher Survey 2007

NSERC's I2I program was launched in December 2003. A project tracking system has been put in place and a summary of the outcomes for the early project funded in shown in Figure 70. Early results for the program are very positive, with 3 spin-off companies created and numerous licences signed. The uptake by partner companies has been impressive and most projects are reaching a successful technology transfer result.

Figure 70
Idea to Innovation Project Results
(74 projects tracked)

• Technology taken up by company	6
• Phase I moved into Phase II (a or b)	14
• Planning for Phase II after Phase I	2
• Working with a partner*	22
• Looking for a partner	19
• Unsuccessful projects	11

* negotiating licence, doing testing or other work. Not ready for Phase II nor the market.

Source: NSERC

An evaluation of the College and Community Innovation Program was conducted in 2006-07 and the major findings from the case studies were as follows:

- When interviews were conducted for this review, colleges were only just completing their second year of funding. It was expected that immediate outcomes would be observed, but that only progress towards intermediate outcomes might be expected. It is noteworthy that even during the award period, intermediate outcomes such as new products and competitive advantages were observed.
- Although it was too soon to know the full impact of the work with the colleges, industry partners anticipated product and process improvements that will save money. In three cases partners foresaw economic benefits when the results were eventually applied, and believed that they could be quantified in a cost-benefit analysis. Even at this early stage in their collaborations, partners reported specific benefits. These benefits, broadly grouped, included: access to information and technology; improvements in products or processes; and potential economic impacts.

- The program had a positive impact on all six colleges, and for some, it also had a particular impact on an individual school, department or centre. Positive impacts on research capacity and infrastructure, recognition and credibility and training and curricula were reported by all participating colleges.

In the 2007 federal budget, permanent funding for an expanded college program was allocated.

Section 3 – Supplementary Information

3.1 Operations and Organizational Structure

Only a small fraction (approximately 5%) of NSERC's budget is spent on administration, which includes an extensive system of volunteer peer review and site visit committees whose travel expenses are a major part of the cost of quality control of funded research. NSERC management monitors the effective use of these resources and conducts several audits each year to review various aspects of the operations. NSERC audit reports can be found at http://www.nserc.gc.ca/about/aud_eval_e.asp. These audits help contribute to process improvement and reassure Canadians of the most efficient use of their funds.

NSERC operates within a framework of:

(1) programs developed in consultation with the Canadian research and business communities, in the context of the present and future challenges facing the Canadian university and college research system, and in light of Canada's needs and government priorities; and

(2) a rigorous process of peer review for awarding funds within the programs.

The peer review system ensures that funds go only to the best professors and students, and the best research programs and projects. NSERC's involvement guarantees objective and fair review of applications for support.

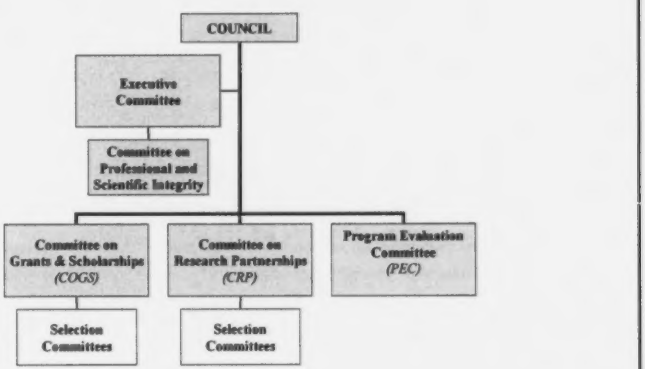
Applications for research funding are judged first and foremost on the merits of the proposed research and on the excellence of the research team; other criteria vary among NSERC's programs and include the training of students, the level of commitment from industrial partners, the plans for interacting with the partners, and (especially for large projects) the design of the project and the proposed management structure.

Applications for direct student support, through NSERC's Scholarships and Fellowships programs, are judged on the student's academic qualifications, as well as his or her potential for research achievement and an assessment of his or her leadership and communication abilities. NSERC recognizes that success in graduate studies, and in a subsequent research career, is dependent on more than academic excellence. An enquiring mind, adaptability and the ability to work well in a team are also essential. In addition to direct support, many other students receive NSERC support indirectly, through research grants awarded to their faculty supervisors.

NSERC is governed by a Council whose members are drawn from industry and universities, as well as from the private non-profit sector, and appointed by the Governor-in-Council. Members serve part-time and receive no remuneration for their participation.

The President serves full-time and functions as the Chief Executive Officer of the Council. In 2007, Council agreed to proceed with making changes to NSERC's by-laws and assigned the role of the Chair of Council to the elected Vice-President. Council is advised on policy and programming matters by several committees. Figure 71 presents NSERC's committee structure.

Figure 71
NSERC's Committee Structure



NSERC is committed to building a network of small regional offices and playing a stronger role in supporting research, training and innovation in all regions of the country. NSERC officially opened its Atlantic Regional Office in Moncton, New Brunswick in October 2004. The second Regional Office was opened in 2005 in Winnipeg, Manitoba and a third in Vancouver in 2006. NSERC will create further offices in Québec and in Ontario in the next two years.

3.2 Financial Tables

An agency overview of financial information for the year 2006-07 is provided below. In addition, Tables 1 to 6 present the financial information required from NSERC for the Departmental Performance Report. The agency's audited financial statements can be found in Appendix A.

Table 1 offers a comparison of the main estimates, planned spending, total authorities, and actual spending for the most recently completed fiscal year, as well as historical figures for Actual Spending. Planned spending is established in the Report on Plans and Priorities which was completed in March 2006. NSERC's actual spending was $6.6 million below planned levels. The variance is mainly due to a lapse in the Canada Research Chairs Program of $5.8 million.

Table 1: Comparison of Planned to Actual Spending (incl. FTE)

Program Activity ($ millions)	2004-05 Actual	2005-06 Actual	2006-07			
			Main Estimates	Planned Spending	Total Authorities	Actual
1.1 - Promote Science and Engineering	2.8	3.8	1.5	4.1	1.5	4.0
1.2 - Support Students and Fellows	120.1	127.7	135.2	137.8	135.3	128.0
1.3 - Attract and Retain Faculty	114.6	128.7	163.8	167.7	163.5	145.2
2.1 - Fund Basic Research	391.8	417.7	411.9	406.3	427.8	440.8
2.2 - Fund Research in Strategic Areas	60.5	56.0	47.9	54.4	50.2	53.1
3.1 - Fund University-Industry-Government Partnerships	102.0	110.5	107.5	115.2	107.8	112.3
3.2 - Support Commercialization	11.2	15.0	17.5	16.5	17.6	12.0
Total	**803.0**	**859.4**	**885.3**	**902.0**	**903.7**	**895.4**

Total	803.0	859.4	885.3	902.0	903.7	895.4
Less: Non-Respendable revenue	(0.9)	(1.1)	n/a	(0.8)	n/a	(1.6)
Plus: Cost of services received without charge	4.8	5.0	n/a	4.9	n/a	5.4
Total Departmental Spending	**806.9**	**863.3**	**885.3**	**906.1**	**903.7**	**899.2**
Full Time Equivalents	**307**	**300**	**n/a**	**313**	**n/a**	**308**

Note: Total Authorities are Main Estimates plus Supplementary Estimates plus other authorities

Table 2 provides information on how resources are used for the most recently completed fiscal year. The difference between the planned spending and the main estimates is mainly explained by the increase received from the 2006 federal budget ($17 million).

Table 2: Resources by Program Activity

2006-07			
Program Activity ($ millions)	Budgetary		Total
	Operating [1]	Grants and Contributions	
1.1 - Promote Science and Engineering			
Main Estimates	0.2	1.3	**1.5**
Planned Spending	0.2	3.9	**4.1**
Total Authorities	0.2	1.3	**1.5**
Actual Spending	0.2	3.8	**4.0**
1.2 - Support Students and Fellows			
Main Estimates	6.8	128.4	**135.2**
Planned Spending	6.9	130.9	**137.8**
Total Authorities	6.9	128.4	**135.3**
Actual Spending	6.1	121.9	**128.0**
1.3 - Attract and Retain Faculty			
Main Estimates	2.9	160.9	**163.8**
Planned Spending	2.9	164.8	**167.7**
Total Authorities	2.9	160.6	**163.5**
Actual Spending	2.5	142.7	**145.2**
2.1 - Fund Basic Research			
Main Estimates	15.9	396.0	**411.9**
Planned Spending	16.1	390.2	**406.3**
Total Authorities	17.5	410.3	**427.8**
Actual Spending	18.4	422.4	**440.8**
2.2 - Fund Research in Strategic Areas			
Main Estimates	3.6	44.3	**47.9**
Planned Spending	3.7	50.7	**54.4**
Total Authorities	3.9	46.3	**50.2**
Actual Spending	3.7	49.4	**53.1**
3.1 - Fund University-Industry-Government Partnerships			
Main Estimates	10.0	97.5	**107.5**
Planned Spending	10.1	105.1	**115.2**
Total Authorities	10.3	97.5	**107.8**
Actual Spending	8.0	104.3	**112.3**
3.2 - Support Commercialization			
Main Estimates	0.7	16.8	**17.5**
Planned Spending	0.7	15.8	**16.5**
Total Authorities	0.8	16.8	**17.6**
Actual Spending	1.3	10.7	**12.0**

[1] Operating includes contributions to Employee Benefit Plans

Table 3 compares total actual spending versus the total authorized spending. Total authorities refers to spending levels approved by the Treasury Board of Canada. As shown above, NSERC did not spend all available funding in 2006-07, incurring a surplus of $8.3 million. Lapsed funding was mainly the result of Canada Research Chairs program.

Table 3: Voted and Statutory Items

	($ millions)	2006-07			
		Main Estimates	Planned Spending	Total Authorities	Actual
70	Operating expenditures	36.0	36.5	38.8	36.5
75	Grants and Contributions	845.2	861.4	861.2	855.2
(S)	Contributions to employee benefit plans	4.1	4.1	3.7	3.7
	Total	**885.3**	**902.0**	**903.7**	**895.4**

Table 4 is designed to show the net cost of a department. It begins with the actual spending and adds services received without charge, and then subtracts non-respendable revenue to arrive at the net cost of the department.

Table 4: Services Received Without Charge

($ millions)	2006-07
Accommodation provided by Public Works and Government Services Canada (PWGSC)	3.6
Contributions covering employers' share of employees' insurance premiums and expenditures paid by TBS (excluding revolving funds)	1.7
Salary and associated expenditures of legal services provided by Justice Canada	-
Other services provided without charge	0.1
Total 2006–2007 Services received without charge	**5.4**

Table 5 highlights non-respendable revenues. Refunds of previous years' expenditures are passed on to the Receiver General for Canada and cannot be spent on programs or operations. NSERC did not receive any respendable revenue in 2006-07.

Table 5: Sources of Non-Respendable Revenue

($ millions)	2004-05 Actual	2005-06 Actual	2006-07			
			Main Estimates	Planned Spending	Total Authorities	Actual
Fund Basic Research						
Refunds of previous years's expenditures	0.9	1.1	n/a	0.8	n/a	1.6
Total Non-Respendable Revenue	**0.9**	**1.1**	**n/a**	**0.8**	**n/a**	**1.6**

Table 6 summarizes total NSERC actual spending on grants versus planned spending, the authorized levels and the main estimates. The difference between the 2006-07 actuals and the authorized levels is due to the lapse in the Canada Research Chairs Program. The difference between the planned spending and the main estimates is in large part explained by the amount received from the 2006 federal budget ($17 million).

Table 6: Details on Transfer Payment Programs (TPPs)

($ millions)	2004-05 Actual	2005-06 Actual	2006-07			
			Main Estimates	Planned Spending	Total Authorities	Actual
Grants						
1.1 - Promote Science and Engineering	2.7	3.6	1.3	3.9	1.3	3.8
1.2 - Support Students and Fellows	113.9	121.7	128.4	130.9	128.4	121.9
1.3 - Attract and Retain Faculty	112.3	126.3	160.9	164.8	160.6	142.7
2.1 - Fund Basic Research	375.5	400.4	396.0	390.2	410.3	422.4
2.2 - Fund Research in Strategic Areas	57.0	52.3	44.3	50.7	46.3	49.4
3.1 - Fund University-Industry-Government Partnerships	94.8	103.2	97.5	105.1	97.5	104.3
3.2 - Support Commercialization	10.0	13.7	16.8	15.8	16.8	10.7
Total grants	**766.2**	**821.2**	**845.2**	**861.4**	**861.2**	**855.2**
Contributions	-	-	-	-	-	-
Other Transfer Payments	-	-	-	-	-	-
Total Grants, Contributions And Other Transfer Payments	**766.2**	**821.2**	**845.2**	**861.4**	**861.2**	**855.2**

3.3 Response to Parliamentary Committees, Audits and Evaluations for 2006-07

In 2006-07 NSERC did not have to respond to questions or recommendations made by Parliamentary Committees. NSERC did not have to respond to any questions from the Auditor General.

In 2006-07 the following audits and evaluations were completed:

- **College and Community Innovation Pilot Program Mid-term Review**
- **Joint Evaluation of Research Tools and Instruments Grants (RTI) and Major Facilities Access Grants (MFA)**
- **Summative Evaluation of the Industrial Research Chairs Program**

The NSERC audit and evaluation reports posted on the web can be found at: http://www.nserc.gc.ca/about/aud_eval_e.asp).

3.4 Service Improvement Initiative

NSERC has implemented a formal and structured service improvement plan that covers the key services it provides to its clients. The plan addresses NSERC's four main lines of business: Operations and Transactions, Program Delivery, Responding to Enquiries and On-line Services. It sets priorities for service improvement and will allow for monitoring progress towards client satisfaction targets. It also calls for periodic client-satisfaction surveys with the objective of improving service delivery and for the updating of the current client-centred internal service standards applied by NSERC's directorates. It is important to note that most of NSERC's key services are delivered to its clientele through the eBusiness Initiative, the NSERC web site and the Helpdesk service.

In compliance with the government-wide Service Improvement Initiative (SII) and on the basis of its service improvement plan, NSERC developed and published its *Performance and Service Standards*, which include a section on the Service Improvement Initiative at NSERC and implemented client satisfaction surveys to establish satisfaction baselines, apply improvement targets and monitor progress towards those targets. The Council will continue to conduct external surveys to gauge the satisfaction level of its clientele with the quality of the key services (please visit the following site for more detailed information: http://www.nserc.gc.ca/about/p_s_standards_e.asp.)

Main achievements in improving service from a citizen-centered perspective – The key client services prioritized for improvement relate to the on-line application submission system, the financial data submission and reconciliation system (FDSR), the NSERC Web site, the Helpdesk service and the annual information visits to Canadian postsecondary institutions. NSERC has continued to refine the delivery and quality of its key services with a citizen-centered perspective in mind, such as:

- Continued improvement of the on-line application submission system to encourage users to conduct NSERC-related business electronically. In 2006-07, more than 80% of applications for funding were received electronically and this percentage is likely to increase in the future. There are plans to consider and possibly introduce the use of a commercial off-the shelf (COTS) grants management system to replace the current eSubmission system. A COTS solution will be easier to maintain and update, will provide significant cost-savings and will help lighten the workload of internal and external users.

- Implementation of an additional 9 client-centered Extranets in 2006-07, for a total of 36 implemented to date. The objective of these Extranets is to share business information, data and/or operations with external clients and to help improve on-line interactions between NSERC, peer review committees and postsecondary institution representatives. Extranets will lighten the administrative load, speed up exchange of documents and offer more convenient, efficient and innovative ways of working with NSERC staff and research community partners.

- Sustained improvement of the Tri-Council (NSERC-SSHRC-CIHR) Financial Data Submission and Reconciliation on-line system (FDSR). An updated, more user-friendly version was implemented earlier this year. This electronic service is

currently hosted by NSERC and it allows postsecondary institutions to transfer financial award data in a single file to the granting councils once all web-based statement of expenditures forms are validated by individual grantees. It provides an on-line alternative to the annual paper submission process.

- Configuring, testing and validating the functionality – for future implementation – of the PWGSC Secure Channel ePass Service. This service will give clients a single user ID and password to authenticate and to self-identify, and to gain access to all of NSERC external electronic services. Currently, users are required to utilize multiple IDs and passwords to access an increasing number of on-line services offered by NSERC. The secure channel mechanism, when implemented, will eliminate client frustration with the current process.

Appendix A – Audited Financial Statements

For the year ended March 31, 2007

Natural Sciences and Engineering Research Council of Canada
350 Albert Street
Ottawa, Canada
K1A 1H5

Conseil de recherches en sciences naturelles et en génie du Canada
350, rue Albert
Ottawa, Canada
K1A 1H5

STATEMENT OF MANAGEMENT RESPONSIBILITY

Responsibility for the integrity and objectivity of the accompanying financial statements for the year ended March 31, 2007 and all information contained in these statements rests with the management of the Natural Sciences and Engineering Research Council. These financial statements have been prepared by management in accordance with Treasury Board accounting policies which are consistent with Canadian generally accepted accounting principles for the public sector, and year-end instructions issued by the Office of the Comptroller General.

Management is responsible for the integrity and objectivity of the information in these financial statements. Some of the information in the financial statements is based on management's best estimates and judgment and gives due consideration to materiality. To fulfil these accounting and reporting responsibilities, management maintains a set of accounts which provides a centralized record of the Council's financial transactions. Financial information submitted to the Public Accounts of Canada and included in the Council's Departmental Performance Report is consistent with these financial statements.

Management maintains a system of financial management and internal control designed to provide reasonable assurance that financial information is reliable, that assets are safeguarded and that transactions are in accordance with the *Financial Administration Act*, are executed in accordance with prescribed regulations, within Parliamentary authorities and are properly recorded to maintain accountability of Government funds. Management also seeks to ensure the objectivity and integrity of data in its financial statements by the careful selection, training and development of qualified staff, by organizational arrangements that provide appropriate divisions of responsibility, and by communication programs aimed at ensuring that regulations, policies, standards and managerial authorities are understood throughout the Council.

../2

Canada

The financial statements of the Council have been audited by the Auditor General of Canada.

Approved by:

Dr. Suzanne Fortier
President

Michel Cavallin
Vice-President
Common Administrative Services Directorate
(Senior Financial Officer)

May 25, 2007

Auditor General of Canada
Vérificatrice générale du Canada

AUDITOR'S REPORT

To the Natural Sciences and Engineering Research Council
and the Minister of Industry

I have audited the statement of financial position of the Natural Sciences and Engineering Research Council as at March 31, 2007 and the statements of operations, equity of Canada and cash flow for the year then ended. These financial statements are the responsibility of the Council's management. My responsibility is to express an opinion on these financial statements based on my audit.

I conducted my audit in accordance with Canadian generally accepted auditing standards. Those standards require that I plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In my opinion, these financial statements present fairly, in all material respects, the financial position of the Council as at March 31, 2007 and the results of its operations and its cash flows for the year then ended in accordance with Canadian generally accepted accounting principles.

Nancy Y. Cheng, FCA
Assistant Auditor General
for the Auditor General of Canada

Ottawa, Canada
May 25, 2007

240 rue Sparks Street, Ottawa, Ontario K1A 0G6

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL
STATEMENT OF OPERATIONS
FOR THE YEAR ENDED MARCH 31
(thousands of dollars)

	2007	2006
EXPENSES (Note 4)		
Fund Basic Research	442,472	419,358
Attract and Retain Faculty	145,290	128,812
Support Students and Fellows	128,615	128,436
Fund University-Industry-Government Partnerships	112,935	111,307
Fund Research in Strategic Areas	53,456	56,320
Support Commercialization	12,034	15,082
Promote Science and Engineering	3,999	3,825
Total Expenses	**898,801**	**863,140**
REVENUES		
Fund Basic Research	2	1
Total Revenues	**2**	**1**
Net cost of operations	**898,799**	**863,139**

The accompanying notes form an integral part of these financial statements.

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL
STATEMENT OF FINANCIAL POSITION
AS AT MARCH 31
(thousands of dollars)

	2007	2006
ASSETS		
Financial assets		
Due from the Consolidated Revenue Fund	3,190	3,169
Accounts receivable (Note 5)	3,058	1,143
Advances	337	340
Total Financial Assets	6,585	4,652
Non-financial assets		
Prepaid expenses	250	67
Tangible capital assets (Note 6)	6,109	5,735
Total Non-Financial Assets	6,359	5,802
TOTAL	12,944	10,454
LIABILITIES		
Accounts payable and accrued liabilities (Note 7)	5,228	3,854
Vacation pay and compensatory leave	1,456	1,354
Other liabilities (Note 8)	-	154
Employee severance benefits (Note 9b)	4,496	4,309
Total Liabilities	11,180	9,671
EQUITY OF CANADA	1,764	783
TOTAL	12,944	10,454

Contractual obligations (Note 10)
Contingent liabilities (Note 12)

The accompanying notes form an integral part of these financial statements.

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL
STATEMENT OF EQUITY OF CANADA
FOR THE YEAR ENDED MARCH 31
(thousands of dollars)

	2007	2006
EQUITY OF CANADA		
Equity of Canada, beginning of year	783	580
Net cost of operations	(898,799)	(863,139)
Net cash provided by Government (Note 3c)	894,367	858,080
Change in due from the Consolidated Revenue Fund	21	257
Services provided without charge from other government departments (Note 11a)	5,392	5,005
Equity of Canada, end of year	1,764	783

The accompanying notes form an integral part of these financial statements.

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL
STATEMENT OF CASH FLOW
FOR THE YEAR ENDED MARCH 31
(thousands of dollars)

	2007	2006
OPERATING ACTIVITIES		
Net cost of operations	898,799	863,139
Non-cash items included in net cost of operations:		
Bad debt expense	-	(37)
Amortization of tangible capital assets (Note 6)	(2,208)	(1,920)
Services provided without charge from other government departments (Note 11a)	(5,392)	(5,005)
Loss on disposals of tangible capital assets	(6)	(4)
Variations in Statement of Financial Position		
Increase (decrease) in accounts receivable	1,915	(295)
(Decrease) increase in advances	(3)	27
Increase (decrease) in prepaid expenses	183	(79)
Increase in accounts payable and accrued liabilities	(1,374)	(21)
Increase in vacation pay and compensatory leave	(102)	(106)
Decrease in other liabilities	154	88
Increase in employee severance benefits	(187)	(525)
Cash used by operating activities	**891,779**	**855,262**
CAPITAL ACTIVITIES		
Acquisitions of tangible capital assets	2,588	2,818
Cash used by capital activities	**2,588**	**2,818**
FINANCING ACTIVITIES		
Net cash provided by Government	**(894,367)**	**(858,080)**

The accompanying notes form an integral part of these financial statements.

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL

NOTES TO THE FINANCIAL STATEMENTS

1. Authority and objective

The Natural Sciences and Engineering Research Council (NSERC) was established in 1978 by the *Natural Sciences and Engineering Research Council Act*, and is a departmental corporation named in Schedule II to the *Financial Administration Act*. Its objective is to promote discovery and innovation and support both research and the provision of highly qualified personnel in the natural sciences and engineering. The Council delivers its objective under seven program activities:

a) *Fund Basic Research*: Invest in discovery through grants focusing on basic research activities.

b) *Attract and Retain Faculty*: Aim to attract and retain faculty.

c) *Support Students and Fellows*: Support training of highly qualified personnel through scholarship and fellowship programs.

d) *Fund University-Industry-Government Partnerships*: Foster collaborations between university researchers and other sectors, including government and industry, in order to develop new knowledge and expertise, and to transfer this knowledge and expertise to Canadian-based organizations.

e) *Fund Research in Strategic Areas*: Fund project research of national importance and in emerging areas that are of potential significance to Canada.

f) *Support Commercialization*: Support innovation and promote the transfer of knowledge and technology to Canadian companies.

g) *Promote Science and Engineering*: Encourage popular interest in science, math and engineering and aim to develop science, math and engineering abilities in Canadian youth.

The Council's grants, scholarships, and operating expenditures are funded by budgetary lapsing authorities. Employee benefits are funded by statutory authorities.

2. Summary of significant accounting policies

The financial statements have been prepared in accordance with Treasury Board accounting policies which are consistent with Canadian generally accepted accounting principles for the public sector, and year-end instructions issued by the Office of the Comptroller General. The most significant accounting policies are as follows:

(a) Parliamentary appropriations

The Government of Canada finances the Council through Parliamentary appropriations. Appropriations provided to the Council do not parallel financial reporting according to generally accepted accounting principles since they are based in large part on cash flow requirements. Consequently, items recognized in the Statement of Operations and the Statement of Financial Position are not necessarily the same as those provided through appropriations from Parliament. Note 3 provides information regarding the source and disposition of these authorities and a high-level reconciliation between the basis of reporting.

(b) Net cash provided by Government

The Council operates within the Consolidated Revenue Fund (CRF). The CRF is administered by the Receiver General for Canada. All cash received by the Council is deposited to the CRF and all cash disbursements made by the Council are paid from the CRF. The net cash provided by Government is the difference between all cash receipts and all cash disbursements, including transactions with departments of the federal government.

(c) Due from the Consolidated Revenue Fund

Due from the Consolidated Revenue Fund represents the amount of cash that the Council is entitled to draw from the CRF, without further appropriations, in order to discharge its liabilities.

(d) Revenues

Revenues consist of interest on overdue accounts receivable and are accounted for as earned.

(e) Expenses

Expenses are recorded on the accrual basis:

- Grants and scholarships are recognized in the year in which the entitlement of the recipient has been established, when the recipient has met the eligibility criteria, the commitment has been approved, and the payment is due before the end of the fiscal year.
- Vacation pay and compensatory leave are expensed as the benefits accrue to employees under their respective terms of employment.
- Services provided without charge by other government departments and agencies are recorded as operating expenses at their estimated cost.

(f) Employee future benefits

- Pension benefits: Eligible employees participate in the Public Service Pension Plan, a multi employer plan administered by the Government of Canada. The Council's contributions to the Plan are charged to expenses in the year incurred and represent the total Council's obligation to the Plan. Current legislation does not require the Council to make contributions for any actuarial deficiencies of the Plan.
- Severance benefits: Employees are entitled to severance benefits under labour contracts or conditions of employment. These benefits are accrued as employees render the services necessary to earn them. The obligation relating to the benefits earned by employees is calculated using information derived from the results of the actuarially determined liability for employee severance benefits for the Government as a whole.

(g) Accounts receivable

Accounts receivable are stated at amounts expected to be ultimately realized. A provision is made for receivables from external parties where the recovery is considered uncertain.

(h) Tangible capital assets

All tangible capital assets and leasehold improvements with an acquisition cost of $2,500 or more are capitalized at cost as well as the standard furniture, equipment and desktop personal computer assigned to each employee due to the material number of such items. Tangible capital assets are amortized over their estimated useful life on a straight-line basis, using a half-year rule in the year of acquisition and disposal, as follows:

Asset class	Amortization period
Informatics equipment including standard software issued on desktop computers	3 years
Purchased network software and in-house developed software	5 years
Other equipment	5 years
Furniture	7 years
Leasehold improvements	Lesser of their useful life or the term of the lease

(i) Contingent liabilities

Contingent liabilities are potential liabilities which may become actual liabilities when one or more future events occur or fail to occur. To the extent that the future event is likely to occur or fail to occur, and a reasonable estimate of the loss can be made, an estimated liability is accrued and an expense recorded. If the likelihood is not determinable or an amount cannot be reasonably estimated, the contingency is disclosed in the notes to the financial statements.

(j) Measurement uncertainty

The preparation of financial statements in accordance with Treasury Board accounting policies which are consistent with Canadian generally accepted accounting principles for the public sector, and year end instructions issued by the Office of the Comptroller General requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenues and expenses reported in the financial statements. At the time of preparation of these statements, management believes the estimates and assumptions to be reasonable. The allowance for employee severance benefits and the estimated useful lives of capital assets are the most significant items where estimates are used. Actual results could differ significantly from those estimated. Management's estimates are reviewed periodically and, as adjustments become necessary, they are recorded in the financial statements in the year they become known.

3. Parliamentary appropriations

The operations of the Council are funded through annual Parliamentary appropriations. Items recognized in the Statement of Operations and the Statement of Financial Position in one year may be funded through Parliamentary appropriations in prior, current or future years. Accordingly, the Council has different net results of operations for the year on a government funding basis than on an accrual accounting basis. The differences are reconciled in the following tables:

(a) Reconciliation of net cost of operations to current year appropriations used

	2007	2006
	(thousands of dollars)	
Net cost of operations	898,799	863,139
Adjustments for items affecting net cost of operations but not affecting appropriations:		
Add (less):		
Interest on overdue accounts receivable	2	1
Refunds of previous years' expenses	1,604	1,141
Amortization of tangible capital assets	(2,208)	(1,920)
Vacation pay and compensatory leave	(102)	(106)
Services provided without charge by other Government Departments and agencies	(5,392)	(5,005)
Employee severance benefits	(187)	(525)
Other adjustments	135	(43)

Adjustments for items not affecting net cost of operations but affecting appropriations:		
Add (less):		
Acquisitions of tangible capital assets	2,588	2,818
Prepaid expenses	183	(79)
CURRENT YEAR APPROPRIATIONS USED	**895,422**	**859,421**

(b) Appropriations provided and used

	2007	2006
	(thousands of dollars)	
GRANTS AND SCHOLARSHIPS		
Vote 75	861,154	824,140
Less: Lapse/Frozen allotment	(5,956)	(2,930)
Grants and scholarships expenditures	855,198	821,210
OPERATING EXPENDITURES		
Vote 70	38,873	36,611
Less: Operating Lapse	(2,325)	(2,195)
Operating expenditures	36,548	34,416
Statutory contributions to employee benefit plans	3,676	3,795
CURRENT YEAR APPROPRIATIONS USED	**895,422**	**859,421**

(c) Reconciliation of net cash provided by Government to current year appropriations used

	2007	2006
	(thousands of dollars)	
NET CASH PROVIDED BY GOVERNMENT	894,367	858,080
Refund of previous years' expenses	1,604	1,141
Variation in accounts receivable	(1,915)	295
Variation in advances	3	(27)
Variation in accounts payable and accrued liabilities	1,374	21
Variation in other liabilities	(154)	(88)
Other adjustments	143	(1)
CURRENT YEAR APPROPRIATIONS USED	**895,422**	**859,421**

4. Expenses

The following table presents details of expenses by category:

	2007	2006
	(thousands of dollars)	
Grants and scholarships		
Fund Basic Research	421,524	400,050
Attract and Retain Faculty	142,433	126,144
Support Students and Fellows	121,678	121,560
Fund University-Industry-Government Partnerships	104,169	103,079
Fund Research in Strategic Areas	49,298	52,234
Support Commercialization	10,647	13,723
Promote Science and Engineering	3,774	3,647
	853,523	**820,437**
Operations		
Salaries and employee benefits	28,031	27,070
Professional and special services	4,816	4,706
Transportation and communications	4,097	3,265
Accommodations and rentals	4,071	3,458
Information	1,235	1,136
Amortization of tangible capital assets	2,209	1,920
Utilities, materials and supplies	587	523
Repair and maintenance	226	621
Loss on disposals of tangible capital assets	6	4
	45,278	**42,703**
Total Expenses	**898,801**	**863,140**

5. Accounts receivable

	2007	2006
	(thousands of dollars)	
Other federal government departments and agencies	2,023	793
External parties	1,071	393
Less: Allowance for doubtful accounts	(36)	(43)
Total	3,058	1,143

6. Tangible capital assets

(thousands of dollars)

	Cost				Accumulated amortization				Net book value	
Capital asset class	Opening balance	Acquisitions	Disposals and write-offs	Closing balance	Opening balance	Amortization	Disposals and write-offs	Closing balance	2007	2006
Informatics	3,777	622	362	4,037	2,522	752	377	2,897	1,140	1,255
Software	4,977	679	-	5,656	2,314	1,080	-	3,394	2,262	2,663
Other equipment	279	-	13	266	253	18	12	259	7	26
Furniture	2,746	414	76	3,084	1,789	146	56	1,879	1,205	957
Leasehold improvements	1,310	873	-	2,183	476	212	-	688	1,495	834
Total	13,089	2,588	451	15,226	7,354	2,208	445	9,117	6,109	5,735

Amortization expense for the year ended March 31, 2007 is $2,208 ($1,920 in 2006).

7. Accounts payable and accrued liabilities

	2007	2006
	(thousands of dollars)	
External parties	3,931	2,896
Other federal government departments and agencies	1,297	958
Total	5,228	3,854

8. Other liabilities

Other liabilities represent earmarked funds held for the North Atlantic Treaty Organization (NATO) and other organizations, and interest generated thereon. These funds must be used for the purposes for which they were received and represent a liability. The transactions are not included in the Council's statement of operations but represent a charge to these accounts

as the Council has simply acted as a facilitator on behalf of NATO and other organizations. Details of changes in the accounts are as follows:

	2007	2006
	(thousands of dollars)	
Balance, beginning of year	154	242
Funds received	-	2
Interest received	2	5
Disbursements	(156)	(95)
Balance, end of year	-	154

9. Employee benefits

Employees of the Council are entitled to specific benefits on or after termination or retirement, as provided for under various collective agreements or conditions of employment.

(a) Pension benefits

The Council's employees participate in the Public Service Pension Plan, which is sponsored and administered by the Government of Canada. Pension benefits accrue up to a maximum period of 35 years at a rate of 2 percent per year of pensionable service, times the average of the best five consecutive years of earnings. The benefits are integrated with Canada/Québec Pension Plans benefits and they are indexed to inflation.

Both the employees and the Council contribute to the cost of the Plan. The 2006-07 expense amounts to $2,709,311 ($2,808,535 in 2005-06), which represents approximately 2.6 times the contributions by employees.

The Council's responsibility with regard to the Plan is limited to its contributions. Actuarial surpluses or deficiencies are recognized in the financial statements of the Government of Canada, as the Plan's sponsor.

(b) Severance benefits

The Council provides severance benefits to its employees based on eligibility, years of service and final salary. These severance benefits are not pre-funded. Benefits will be paid from future appropriations. Information about the severance benefits, measured as at March 31, is as follows:

	2007	2006
	(thousands of dollars)	
Accrued benefit obligation, beginning of year	4,309	3,784
Expense for the year	376	748
Benefits paid during the year	(189)	(223)
Accrued benefit obligation, end of year	4,496	4,309

10. Contractual obligations

Payments of grants and scholarships extending in future years are subject to the provision of funds by Parliament. Future years awards adjudicated prior to March 31, 2007 are payable as follows:

	(thousands of dollars)
2007-2008	772,594
2008-2009	534,573
2009-2010	317,897
2010-2011	190,585
2011-2012 and subsequent years	111,399
Total	1,927,048

In addition, the nature of the Council's operating activities can result in some large multi-year contracts and obligations whereby the Council will be committed to make future payments when the services or goods are rendered. Significant contractual obligations that can reasonably be estimated are summarized as follows:

	(thousands of dollars)
2007-2008	144
2008-2009	138
2009-2010	129
2010-2011	68
2011-2012 and subsequent years	25
Total	504

11. Related party transactions

The Council is related as a result of common ownership to all Government of Canada departments, agencies and Crown Corporations. The Council enters into transactions with these entities in the normal course of business and on normal trade terms.

During the year, the Council received services which were obtained without charge from other government departments as presented in (a):

(a) Services provided without charge

	2007	2006
	(thousands of dollars)	
Accommodations provided by Public Works and Government Services Canada	3,579	3,260
Contributions covering the employer's share of employees medical and Dental insurance premiums provided by Treasury Board Secretariat	1,749	1,648

Other services received without charge	64	97
Total services received without charge	5,392	5,005

(b) Administration of programs on behalf of other government departments

The Council administers funds received from other federal government departments and agencies to issue grants, scholarships and related payments on their behalf. During the year, the Council administered $19,797,115 ($21,559,148 in 2006) in funds for grants and scholarships. These expenses are not reflected in the Council's Statement of Operations but rather are recorded in the financial statements of the departments or agencies that provided the funds.

The Council also recovers administrative fees in some circumstances where a significant administrative burden is incurred by the Council for the administration of certain funds on behalf of other federal government departments and agencies. These amounted to $802,809 during the year ($611,157 in 2006) and were netted against the Council's operating expenses.

12. Contingent liabilities

In the normal course of its operations, the Council becomes involved in various legal actions. Some of these potential liabilities may become actual liabilities when one or more future events occur or fail to occur. To the extent that the future event is likely to occur or fail to occur, and a reasonable estimate of the amount can be made, this estimated amount is recorded in the financial statements. In 2006, the Council was served with a statement of claim arising from 14 plaintiffs. The potential liability of the Council and consequent damages arising from such a liability could amount to approximately $2.8 million. Currently, the Council assesses that this claim is unlikely to result in a liability.

13. Comparative information

Certain comparative figures have been reclassified to conform to the current's year presentation.

Appendix B – Council Membership

NSERC is governed by a Council composed of a full-time president and up to 21 members selected from the private sector, the public sector, and the universities, each appointed by Order-in-Council. In accordance with the *Natural Sciences and Engineering Research Council Act,* the President is the Chair of Council and the Chief Executive Officer, responsible for directing the work and the staff of NSERC.

The following is the membership as of March 31, 2007.

President

Dr. Suzanne Fortier
President
Natural Sciences and Engineering Research Council of Canada
Ottawa, Ontario

Vice-President

Dr. Joanne Keselman
Vice-President (Research)
University of Manitoba
Winnipeg, Manitoba

Members

Mr. Alain Bellemare
President
Pratt & Whitney Canada Inc.
Longueuil, Québec

Ms. Claude Benoit
President and Chief Executive Officer
Old Port of Montréal Corporation/Montréal Science Centre
Montréal, Québec

Dr. Max Blouw
Vice-President, Research
University of Northern British Columbia
Prince George, British Columbia

Dr. Edwin Bourget
Vice-President (Research)
University of Sherbrooke
Sherbrooke, Québec

Dr. Jillian M. Buriak
Professor of Chemistry
University of Alberta
Edmonton, Alberta

Dr. Harold Edward Alexander Campbell
Vice-President (Academic) and
pro Vice-Chancellor, Chief Academic Officer
Memorial University
St John's, Newfoundland

Dr. Adam Chowaniec
President
Tundra Semiconductor Corp.
Ottawa, Ontario

Dr. Christopher Essex
Professor of Applied Mathematics
University of Western Ontario
London, Ontario

Dr. Haig deB Farris
President
Fractal Capital Corp.
Vancouver, British Columbia

Dr. Louis Fortier
Professor, Department of Biology
Université Laval,
Québec, Québec

Members, cont.

Dr. Mike Lazaridis
President and CEO
Research in Motion Ltd.
Waterloo, Ontario

Dr. Eugene McCaffrey
Mississauga, Ontario

Dr. Murray McLaughlin
Director
McLaughlin Consultants Inc.
Guelph, Ontario

Dr. Maurice Moloney
Chief Scientific Officer
SemBioSys Genetics Inc.
Calgary, Alberta

Dr. Barbara Sherwood Lollar
Professor, Department of Geology
University of Toronto
Toronto, Ontario

Dr. Mary Anne White
Professor, Department of Chemistry
Dalhousie University
Halifax, Nova Scotia

Dr. Robert Young
Dept. of Chemistry
Simon Fraser University
Burnaby, British Columbia

Associates of Council

Dr. Alan Bernstein
President
Canadian Institutes of Health Research
Ottawa, Ontario

Dr. Pierre Coulombe
President
National Research Council Canada
Ottawa, Ontario

Dr. Chad Gaffield
President
Social Sciences and Humanities Research Council of Canada
Ottawa, Ontario

Corporate Secretary

Ms. Barbara Conway
Corporate Secretary
Natural Sciences and Engineering Research Council of Canada
Ottawa, Ontario